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Journal of the Society of Arts.

FRIDAY, MAY 15, 1868.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday evenings, at Eight o'Clock :—

MAY 20.—“On the Condition of the Agricultural Labourer.” By J. BAILEY DENTON, Esq. On this evening WILLIAM HAWES, Esq., F.G.S., Chairman of the Council, will preside.

MAY 27.—Derby-day.—No MEETING.

CONVERSAZIONE.

The Council have arranged for a conversazione, at the South Kensington Museum, on Wednesday, the 3rd June, cards for which are now being issued.

SUBSCRIPTIONS.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed “Coutts and Co.,” and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOOD COMMITTEE.

The Committee met on Wednesday, April 8th. Present—B. Shaw, Esq. (in the chair); Messrs. Harry Chester, J. Ludford White, G. F. Wilson, F.R.S., and J. Ware.

The Rev. M. J. BERKELEY attended for the purpose of giving information on the subject of fungi, and said—Gentlemen, in the observations I have to make to-day you must not expect any novelty, for I am not aware that anything very important has been discovered lately, with respect to the nutritive powers of fungi. I may begin by assuming that those nutritive powers do exist. Everybody knows that fungi are rich in nitrogenous matter, and that in very many cases they will make a very good substitute for meat. Fungi are abundantly employed in Russia, and in winter become a staple commodity. Enormous quantities are preserved in salt and a certain proportion of vinegar, and are consumed very largely. I think they preserve them almost indiscriminately, with the exception, perhaps, of a few which are acknowledged to possess narcotic principles. For instance, they would scarcely preserve such a fungus as *Agaricus muscarius*. In Terra del Fuego, again, they are for several months the staple food of the country. One of the natives was here a few years ago, brought over by Capt. Fitzroy, and he was asked what they had to eat there. He said, “Plenty of fish, and too much summer fruit;” the “summer fruit being *Cyttaria Darwinii*, which is a parasite, on the evergreen beech, and which is found in Terra del Fuego to a very large extent. This fungus has a curious habit, because

it grows up in the same manner as the gelatinous parasites on different species of juniper, year after year. When dried it looks very much like a piece of dried cowheel, and I have no doubt is extremely nutritious. During the late unfortunate war between the Northern and Southern States of America, when, in the latter part of the time, the people of the Southern States were very much pressed for food, they found fungi of very great importance to them. I have had two or three letters from Dr. Curtis, of South Carolina, in which he has told me that this was the case. He is a person who understands fungi very well, and he has sent me several thousands of specimens—at least six thousand, most of them of different species. He has promised to send me a paper upon the subject, and a very interesting paper I am sure it would be, but I have not yet been able to obtain it. In this country the great difficulty is to overcome prejudice. There is a strong prejudice against fungi. With the exception of the common mushroom—which is far from being one of the most common species in this country—the moment a fungus is found it is destroyed, and that very frequently even by persons of education, as an object of danger or disgust. I believe there was originally some superstition connected with this practice. It is a well-known fact—too well known to archaeologists—that if a labourer finds a piece of pottery, or anything of that kind, the first thing he does is to break it. What does he do it for? He does not know why he does it, but there was an old superstition that there was a spirit in it, and he is afraid lest the spirit should do him some harm, and so he breaks it to let the spirit out. I believe there was formerly very much the same feeling with regard to fungi, and some shadow of it still remains. One finds this prejudice, perhaps, more strong in other parts of Great Britain than in England. It is extremely strong in Scotland. I have spoken to people there,—very sensible people, and naturally without any great prejudices, who would not on any account venture to eat any kind of fungus. I am not certain, even, that they would make an exception for *Agaricus campestris*. If you go to Wales, what do you find there? The word which they use for fungi is *bwyd y barcud* or *bwyd y llyffant*, that is “kite’s food,” or “toad’s food,” and they have exactly the same prejudice against their use. There is no doubt that this strong prejudice is one of the reasons why fungi are so very much neglected in this country. Another point is, that even when you point out to people the species which are acknowledged to be esculent, they find, unfortunately, that these things occasionally either prove, or are reported to be, poisonous. Some years ago Professor Henslow sent me some specimens of *Agaricus personatus*, which were said to have proved extremely poisonous to some people in Queen’s-lane, Cambridge. There were certainly two or three deaths apparently from eating this species, which is sold in Covent-garden market, or used to be sold there, under the name of “blewits.” I never saw it there myself, but I speak on the authority of Old Sowerby and Mrs. Hussey, and other people who are connoisseurs in fungi. This species is considered to be perfectly harmless; I have no doubt it is very nutritious, though the flavour of it is not very captivating. Even *Agaricus campestris* is said sometimes to prove poisonous. It is absolutely excluded from the markets in Rome, as it is there considered to be the most poisonous species they have. At home we sometimes meet with reports of cases of poisoning from it. There was one which happened last year to the family of an Italian warehouseman in London. There was one death, and I believe several members of the family were very ill in consequence of partaking of the fungi. A particular friend of mine was out at a party last year, and ate a portion of some *entrée* in which there were some mushrooms, apparently *Agaricus campestris*. He was taken most seriously ill, and very nearly died in consequence. But there is one thing to be considered, and that is, that we must look upon these things, in

some measure, as idiosyncracies. There was a case at Stamford, a few days ago, in which a person was taken most seriously ill from eating a crab, which had been just boiled. There was no question about its condition; it had been alive in the morning, and was only just boiled, and yet the person became most seriously ill afterwards. I know a person who cannot take anything that has the least particle of egg in it. Some time ago, he told me himself that he was in Kent, and went to dine at a friend's house. He is always extremely cautious as to what he eats. There was an apple pudding, and he thought it was utterly impossible that there should be any egg entering into its composition. He ate some of the crust, and was taken very seriously ill, and on inquiry he found that there had been an egg put into the crust. These cases, however, I believe are pure idiosyncracies.

Mr. HARRY CHESTER—There was an inquest held the other day on a person who was said to have been poisoned by a goose. Let me ask you one question. You have told us that fungi are a very important article of food in Russia. Is it not also the case that in other countries beside Russia fungi are much more eaten than they are in England—in France and Italy, for instance?

Mr. BERKELEY—I dare say it is, and I shall come to them presently; but the reason why I mentioned Russia was, that there fungi are a staple food. In the south of France I am not aware that they lay them up for winter store by pickling, or anything of that kind, but they do suspend a few on strings, and dry them for future use. They certainly eat a great many there. There are a great many people in this country who eat fungi very largely, but I say, even making every allowance for prejudice and for these occasional accidents, I think there is no doubt that a great deal of very valuable food is wasted and neglected. Of course, the distinction of good species from bad species is a matter of experience, but it is an experience that we are all of us accustomed to. A person goes to a brook and gathers watercresses. There are several poisonous or disagreeable plants occasionally mixed with them—as brooklime, wild celery, *Cicuta virosa*, and other things, but every watercress gatherer knows how to discriminate between the one and the other. Again, one hears of cases of gross ignorance in which aconite is substituted for horse-radish, but no person who has ever seen a root of aconite and a root of horse-radish could, one would think, by any possibility make any difficulty about it. There was a case, I think, about ten days ago at Stamford, not a fatal case, but one in which a most serious illness arose in that way, but this is gross ignorance and carelessness, arising from want of observation, which it is impossible for us to guard against. From my own village, where I am incumbent, I can give you a proof of how valuable fungi may be. Our schoolmaster was a person of some scientific information. He had made a nice little collection of entomology, and was employed as amanuensis by Mr. Baker, when he commenced his History of Northampton. You will see by this that he was a man a little above the ordinary level. At a time when he could not afford to buy meat he told me himself that he kept his family for several months upon different species of mushrooms. He was a person who was able to distinguish between that which was good and that which was bad, and he collected them himself. Even *Agaricus campestris*, as I said just now, is said occasionally to prove poisonous. There is so much fear in France lest something should be substituted for it, that no specimens of the common mushroom are allowed to come into the markets except those which are raised artificially in the catacombs at Paris. It is considered pretty certain that those at least will be true mushrooms, but I do not think that that is quite so certain. I myself have seen a great variety of fungi which have been grown artificially. I had the other day two baskets of fungi—apparently very fine specimens of *Agaricus campestris*. I took one out of one

basket, and I found that the gills were perfectly white, and they had not a trace of spores about them. This surprised me very much, and I thought it might have arisen from their having been grown under peculiar circumstances. To my great surprise, when I looked at the other basket, which contained apparently still finer samples, there were some in which the gills were in a still worse state, and one in which they were very nearly obliterated. The obliteration of that, and indeed the white colour, was produced by a parasitic fungus of the genus *Hyphomyces*. I have had specimens submitted to me before, which were very much altered by this parasite, and I think it is very doubtful whether fungi affected in that way would be good articles of food. At any rate, I am quite sure that the mycelium of this parasite would penetrate every part of the fungus, and it would probably take away any good quality it had. You go into Covent-garden market, and you see an enormous quantity of mushrooms there, but you scarcely ever see a single specimen of *Agaricus campestris*, except those which are artificially grown. I scarcely ever saw a true *Agaricus campestris* in Covent-garden market, except in the arcade, though one sees there sometimes forty or fifty bushels of *Agaricus arvensis*. In my own part of the country scarcely anybody will eat it, as it is supposed to be poisonous. This, however, is a prejudice, and a very mischievous prejudice, because *Agaricus arvensis* is perfectly wholesome, except perhaps one or two varieties, which I will mention presently. Some years ago, when my friend the Rev. Richard Thomas Lowe, who is a well-known naturalist, and accurate observer—as everybody is well aware who has ever studied his “Flora of Madeira,” first went to his living at Lea, near Gainsborough, he found that the people would not eat mushrooms belonging to this species. There they grow in immense abundance, and acquire frequently a large size. I have seen some of them which weigh several pounds. He ate them himself, and the consequence was that the people began to think if he ate them with impunity, they might, and now the Leeds market is supplied pretty profusely with this species from this part of the country, and many cartloads go up to the market. I have seen myself in Northamptonshire rings as large in diameter as this room, producing an enormous quantity, which the people neglect, except for ketchup. I eat them myself, but there are very few people who will venture to do so. Still, as I have already said, every variety is not wholesome, and people have a very great prejudice against any mushroom which turns at all yellow. The best mushrooms, as everybody knows, are red when they are bruised, but the horse-mushrooms, as they are called, are not red, but rather yellow. There is a variety which grows under hedges, a very handsome plant, of an intense yellow when bruised, which I believe to be poisonous, and I certainly should not recommend anybody to eat that variety, or indeed any variety where the juice turns to an intense yellow, as is sometimes the case; but where the change is only to a pale yellow, I believe it is quite as wholesome as *Agaricus campestris*. Some time ago I was at the table of a friend in my neighbourhood, and an *entrée* was handed round to me, in which I saw some of these intensely yellow mushrooms. I tasted one of them, and the flavour was so rank that I thought it was far better to give my host a hint on the subject, than from false politeness to allow his guests to be poisoned, as I believe they would inevitably have been if they had eaten them. I think that that is a very important point about *Agaricus arvensis*; but thousands of people eat the ordinary form of the species in London every day in autumn, and I have never heard of anybody suffering from them. I will come to ketchup presently. I have done now with this and *Agaricus campestris*, and I will take next in order *Agaricus gambosus*. There has been great confusion about this, because old Sowerby imagined that it was the St. George's *Agaric* of Clusius, because it comes rather early in the year. It is a perfectly white fungus, the surface of the pileus shining, and very closely re-

sembling that of a cracknel. It grows in rings, in exposed pastures, in various parts of the country, after the first April rains, which generally come about the 20th of April. It is an excellent species, and one that a person cannot very well make any mistake about. It sometimes attains a large size; is excellent in flavour, and perfectly wholesome. I have sometimes met with them in very great abundance. *Agaricus procerus*, again, is a most excellent mushroom. It is tall, with the pileus white and scaly. It is a mushroom of a delicate flavour. I have seen it grow in immense quantities, and it must be considered a very useful species. It is said to be sometimes sold in Covent-garden market. It must not be confounded with a somewhat similar species, *Agaricus rachodes*, every part of which turns red when bruised. *Agaricus personatus* I have mentioned before. It is a coarse fungus, but I believe in general perfectly innocent, and it is one which, late in autumn, is produced in many parts of England in the very greatest abundance. I am sure that at any time of scarcity or famine it would be a valuable article of food, though I do not say that it would be quite so agreeable as some other species. Then we come to the large puff-ball *Lycoperdon giganteum*, which attains a considerable size. That, too, is of value. It must, however, be used before the slightest change in colour takes place, as it then becomes rank, and acquires a very disagreeable flavour, but in its young stage it is a most excellent esculent if properly cooked. It is very much esteemed in Italy. The fungus is gathered when young, and kept in a cellar, slices being cut off as they are wanted. The plant is often kept for a considerable length of time, and is much esteemed, but I doubt very much whether you would get anybody to eat it in this country except connoisseurs. Unfavourable reports are sometimes made, but I suspect that large states of other kinds are sometimes confounded with it. *Agaricus rubescens* is one of our most abundant fungi. In fir woods you may get almost any quantity. It grows on the ground, and is easily distinguished from other allied species by its turning red when bruised. I cannot say I ever eat it myself, though I know many people who do. My friend Dr. Hogg eats it, and considers it extremely good. It is a very abundant species, and it is one of those species that a person with the slightest powers of discrimination may distinguish accurately from others. You would, indeed, say that it is utterly impossible to confound it with *Agaricus muscarius*; but, still, until people are educated for these things, accidents will happen. Some years ago a curious thing happened to my friend, Dr. Badham. He gathered some of these Fly agarics, and sent them over to a friend's house—not, however, to be eaten, but to make a decoction to kill flies with. The gentleman of the house was unfortunately from home; but there were two ladies there, his wife and his sister. When they saw them they thought that they were nasty poisonous-looking things, but said, "Dr. Badham would never have sent them here if they were not wholesome; we will have them dressed, and served up for breakfast." Accordingly, they had some of them dressed, and ate them, and in about a quarter of an hour they began to get very ill, and in a very short time they were both carried up to bed in a state of deep intoxication. This is the very species which the people in Kamschatka, and some parts of North Asia, use for the purpose of intoxication. Poor Dr. Badham was always getting into scrapes, of one kind or another, with fungi. He was made very ill one day, in a very curious manner, from a very small quantity of fungus—so small a quantity that you would have thought it utterly impossible that he could have been at all poisoned with it. He got one of those large milky fungi, *Agaricus velleus*, and laid it in a plate to collect the seeds—or, more correctly speaking, the "spores." He simply put his finger in his mouth, wetted it, passed it through the spores, and then licked them off, and, to his great surprise, was ill in consequence. There was also a case in which not he himself,

but his schoolmaster, was the sufferer. This schoolmaster, after the example of his master, ate, amongst other species what he supposed to be *Agaricus ostreatus*, a very indifferent species. The schoolmaster unfortunately mistook for this *Agaricus euosmos*, which he could only do from extreme carelessness, and suffered much in consequence. Dr. Badham, of course, bore the blame which was simply due to his schoolmaster. The doctor stayed with me once, and we had all sorts of things cooked. At last we got *Agaricus deliciosus*, and my cook said she was sure that if we ate it we should be poisoned, and she absolutely refused to cook it. It is one which grows in very great abundance in fir woods occasionally; and I can positively state myself, having partaken of it, that it is most excellent, but it is a most questionable looking thing to a person who does not know anything about it, because when you break it a bright orange-coloured blood exudes in enormous quantities, which soon turns green; so one need scarce wonder at some degree of hesitation. I must not omit the very best of all our fungi, which is *Marasmius oreades*. This is one which is produced sometimes in very great abundance. I have seen it where you could actually get bushels of it. It has an extremely fine flavour, and makes, perhaps, the very best ketchup that there is. I have also seen it in immense abundance at Kew, accompanied by another species, *Marasmius urens*, which has a very acid taste, and which is in all probability poisonous, and it would therefore be very necessary to distinguish between the two. But the true *Marasmius oreades*, or *Champignon*, as it is sometimes called, has cream-coloured gills, while *Marasmius urens* has brownish and much narrower gills, so that a person ought not to make any difficulty about it. Before we get out of the genus *agaricus* and its near ally, *Marasmius*, I might mention some other species, but I think I have noticed the principal ones. We come now to *Boletus*. In this genus there is one most excellent fungus, *Boletus edulis*. In my part of England it is very scarce, but in some parts of England it is abundant, particularly about Tunbridge Wells, and it is now very much used there, in consequence of Dr. Badham having brought it into notice. I had some cooked last year in Sussex, and everybody pronounced it excellent. But there are many species of *Boletus* which are acknowledged to be poisonous, and should be carefully distinguished. The grand distinctive character of *Boletus edulis* is the reticulated stem, which is accurate enough when comparison is made with its own immediate allies, but in the poisonous group distinguished by the mouth of the tube being red and the flesh becoming blue. When broken, the stem is sometimes reticulated, and there are other instances. *Boletus fellens*, for example, might be very easily indeed mistaken for it as regards external appearance, though its bitter taste ought to distinguish it; people, however, do not always taste fungi when they get them. Mr. Salter, indeed, who was formerly attached to the Geological survey, informs me that when at a distance from places amongst the mountains, where he could not obtain food, he had made use of various species of *Boleti*, and found them an excellent substitute for meat. Unfortunately we have no accurate information as to the particular species. I must not omit the common chantarelle, *Cantharellus cibarius*. I have seen it in Scotland in the utmost profusion, but no one could be induced to eat it, as it is thought to be poisonous, though its very agreeable smell is highly in its favour. There is another fungus, *Hydnum repandum*, which is a most excellent one, but it requires a little caution in the preparation for the table. It should be previously steeped in hot water, and well drained in a cloth, in which case there certainly is not a more excellent fungus than it is. I said I would say something about ketchup. There are persons in our Midland Counties who are great ketchup merchants. They purchase what is collected about the country, and store it in barrels, with enough salt to prevent putrescence, and sometimes keep the mass for two

or three years, till it commands a good price, when it is boiled down with spice, strained, and sold as ketchup. I believe they use anything that yields a black juice almost indiscriminately. Such watery species as *Copirrus atramentarius*, known under the name of "numparels," and other of these deliquescent fungi are in great favour, though their only merit is yielding a great quantity of juice, which is of an intense black, on account of the enormous quantity of spores which it contains. I know that they use these in great quantities, and certainly they do not improve the flavour of the ketchup, but one never hears of any accident from the ketchup so made, and I suppose that something may depend on the quantity of salt which is used, and the comparatively small quantity of the condiment which is consumed at any single time. Whether that has any effect upon the amanitine, which I believe is the poisonous principle in fungi, is perhaps doubtful. One would suppose that the vinegar, as used in Russia, would be more likely to neutralise it. I never heard of anybody being poisoned with this abominable ketchup. A great portion of that which comes to London is probably made in the way I have mentioned. I believe I have mentioned the principal facts, as far as I know them, which bear upon the question of fungi as an article of food. There are one or two useful treatises on the subject. I think Mr. Cooke's is a nice little book, but if I recommended one rather than another it would Dr. Hcgg's. Then there are two tables of fungi—one of esculent fungi, and the other of poisonous fungi, which are published by Groombridge, and which, I think, are good things to hang up in a school. They are by Mr. Werthington Smith, but I do not think they quite do justice to his drawings. It would be an excellent thing if he could be induced to publish a series, of the natural size, of those fungi with respect to which there can be no mistake; and if the Society of Arts would undertake anything of the kind, I have no doubt he would be very willing to supply the figures. He is a most excellent draughtsman, and is familiar with a large portion of the British species of fungi. I have before me something which has interested me very much. It is a box of specimens of a new method of preserving fungi. They are not models of fungi, but real specimens of fungi, and you see how beautifully the gills are preserved. (The reverend gentleman handed to the Chairman the specimens referred to.) These have been sent to me by a man of the name of English, at Epping. He tells me that he has been in the habit, for some years, of going about Epping Forest collecting insects; that he admired fungi very much, and that he tried several experiments about preserving them. They are preserved with wax, but I do not know the exact method which is pursued.

MR. HARRY CHESTER—Would it not be a good thing to have specimens like that in the South Kensington Museum?

MR. BERKELEY—Certainly; and I have no doubt that Mr. English would be most glad to supply them.* I have his letter in my pocket. It is as follows:—"Epping, Feb. 24th, 1868.—Reverend sir,—Having rambled over the forest and woods for many years in search for insects (*Lepidoptera*), and observed the numerous species of fungi growing in the neighbourhood of Epping, the forest being very extensive offers a good opportunity for a collector. In the autumn of 1866 I commenced collecting fungi, in hopes of preserving them in form and colour; but, to my great dismay, I found many difficulties to encounter—gills collapsing and shrivelling, and a host of other troubles. But perseverance soon rewarded me with perfect specimens—perfect so far as dry specimens could be, to my thinking. I continued to collect specimens, and mounted about thirty species under a glass shade, which gave a very pleasing effect, and were admired by those that saw them; but as those

gentlemen did not know anything about fungology, I could not obtain any information on the subject. Last autumn I purchased your excellent work ("Outlines of British Fungology"), and found a great deal of necessary information. I now began working more in earnest, and collected a great many species. I commenced by making a careful outline of each species, and copied the contour of pileus, gills, and stem, and numbered each species before drying. In order to give them a pleasing aspect and life-like appearance I waxed them over, which preserves them from damp, and they do not mould or get out of shape. Now, whether this waxing and mounting is admissible to science, and retains enough of character to make them of sufficient interest to form collections, I have to ask your opinion on the specimens sent, being a fair example of what I have done, although not the most difficult. Among those I have mounted are *Phallus impudicus*, *A. atramentarius*, *A. fascicularis*, showing the cespitose character, and *A. radicans*, with its long stem and distant gills, and many others that are very difficult. Although I am aware that many species would be impossible to preserve, would it be worth persevering in the plan, and carrying it out as far as practicable? The *Boleti* are very difficult, but I feel certain of success from some experiments I have made with them. I have enclosed some dried specimens, with corresponding numbers, showing them as they are before waxing. I do not want them returned, if you should like to show them to any of your friends and fellow-workers in this beautiful study.—I have the honour to be, reverend sir, your most obedient servant, JAMES ENGLISH."

MR. HARRY CHESTER—If Mr. English would undertake the labour of making a collection, and you would look at it, I should think it would be very valuable.

MR. BERKELEY—I have no doubt he would make a very nice collection. If you compare these with the models that are in the British Museum, you will see that they are more natural.

THE CHAIRMAN—Can you suggest any means to us by which, by giving information, some degree of the popular prejudice might be removed? Do you think any intelligent greengrocer in Covent-garden market would exhibit a set of those which you guarantee as wholesome?

MR. BERKELEY—I see considerable difficulties in such a plan.

THE CHAIRMAN—Is there any evidence as to what one might call the digestibility of fungi? Because a thing may not be poisonous, and yet, to a considerable extent, be indigestible.

MR. BERKELEY—I might have said that one reason why people suffer from eating fungi is, that they come home excessively hungry; having got a basket of these things on their way home, they are cooked, and then two or three pounds are consumed, and they wonder very much if they prove indigestible. Some years ago Dr. Willdenow determined to make the experiment how far he could live upon fungi. He went into the woods, and confined himself to fungi, and the black bread which they have in his country, and said he was never so well in the whole course of his life as he was when he persevered for a considerable period in that regimen.

MR. FOSTER—Are those he ate considered indigestible?

MR. BERKELEY—Yes; but then he masticated them with the bread. We find in England that fruit is very indigestible. In Germany, however, many persons half live on fruit, but then they eat their brown bread with it. I believe all sorts of fruit are wholesome if you masticate it well with bread. I conceive there is nothing specially indigestible about fungi. If you swallow great lumps, of course it becomes like so many pieces of sponge, but properly masticated with bread, I do not believe there is anything specially indigestible about them. I should not recommend anybody to eat any species of mushroom that was not perfectly fresh.

* Mr. Berkeley has since had a letter from Mr. English, in which he promises to present the Museum with a group similarly prepared.

Mr. HARRY CHESTER—There is, unfortunately, a difficulty in London in getting such things fresh, but could they not be properly dried, and reduced to powder and preserved? It seems to be done in foreign countries.

Mr. BERKELEY—In the Italian shops they sell powdered mushroom, but I suspect there is occasionally a great deal of chalk in it. I could never make any use of the powder. It is clear that it would be a difficult thing to dry any mushroom so as to reduce it to powder.

Mr. CHESTER—Could you tell the committee anything about mushrooms as compared with meat?

Mr. BERKELEY—I am not aware that there is any very good analysis of mushroom. The best, perhaps, is in Thompson's Chemistry. However, there is a large quantity of nitrogenous matter in it. I do not know that there is any ozmazone in it. I am not aware of any very recent analysis. It would be a desirable thing to have plates illustrating the different species of fungi. There are two sheets published by Hardwicke, but I think the fault of those is that there are too many species on each sheet. Five or six would be quite enough, instead of which there are perhaps twenty. Another thing is, that many of them are things which are not at all likely to be met with in any quantity, and which might therefore be omitted. What you want is a few really good figures of a few common things. I think it would be a good thing to get a good analysis of mushrooms from the School of Mines.

Mr. HARRY CHESTER—Are fungi much affected with parasites?

Mr. BERKELEY—They are sometimes very much infested with the larva of flies, which makes them extremely disagreeable. I should not like to eat them in that condition. I have seen mushrooms dressed in which the larva were absolutely not killed by cooking. One might get them into one's stomach and produce very unpleasant results.

Mr. FOSTER—There is a mushroom which grows in what are called "fairy-rings."

Mr. BERKELEY—That is *Marasmius oreades*. It is one of the best. Many *Agarici*, however, have the same habit, as, for instance, *Agaricus arvensis*.

Mr. HARRY CHESTER—There is also one which grows on the tree—an orange red.

Mr. BERKELEY—That is *Fistulina hepatica*. It is not very common. It grows on oak trees. Some years ago I was staying in Flintshire, and found a most magnificent specimen of that in the park of a friend. We had it cooked, and it certainly was one of the very best things I ever ate, but then it was prepared by a skilful cook. It is not good when inartistically dressed.

Mr. CHESTER—Could you mention any little treatise that would be useful in schools?

Mr. BERKELEY—No; they must be expensive, because they must have good and well-coloured representations; they are of no use unless well coloured.

Mr. HARRY CHESTER—Would it not be desirable for the Horticultural Society (particularly now that there are so many shows held in different parts of the country) to offer prizes for the best collection of wholesome mushrooms? It would call the attention of people to it.

Mr. BERKELEY—I will bring this matter before the society.* I am in communication with Mr. Ingram, the gardener to the Duke of Rutland, and he has promised to make experiments to show what difference there is between field mushrooms and the *Agaricus campestris* grown from spawn. Those that grow in the open field are of a much better flavour, and more digestible. Mushrooms are grown at Belvoir in a very curious way. The Duke of Rutland has a large riding-school where they exercise the horses. They put straw down, and

the horses going round and round tread it till it becomes almost as small as chaff, and it is found to produce most excellent mushrooms. Experiments have been made at the Horticultural Society with regard to the growing of oesulent fungi, but I am sorry to say they have failed entirely. We also took great pains to grow truffles, but that was equally abortive. I think we require to know a great deal more about them than we do at present. It is quite certain that *Agaricus campestris* is not so frequent in the country as it formerly was, whether on account of some of the improvements in the mode of agriculture or not I do not know. I know they were much more abundant when I was a boy than they are now. We never thought then of eating any that was not a real pink-gilled mushroom, and no cook would ever use anything else. There is one excellent fungus which I have not mentioned—*Morehella esculenta*. It is very rare in my part of the country, but I do not know that it is so in the South of England. It is the morrel of commerce. It grows about Margate in such abundance that they make ketchup of it. Many fungi besides *Agaricus campestris* come up in mushroom beds. There is a white-gilled one which is very common at Belvoir, whether the spawn is used under shelter or in the open ground, which is probably wholesome. I have lately received specimens of *Agaricus phalarinarum*, which came up in great abundance at Street, in Somersetshire, on a sea-kale bed, and proved a very agreeable and wholesome article of food.

Mr. FOSTER—Do you think any of these species of mushrooms could be cultivated commercially?

Mr. BERKELEY—Mr. Ingram has tried, and he is a most excellent cultivator, but he has never been able to succeed. I supplied him with the spawn of those very things that we tried at the Horticultural Society, but he had no success.

Mr. M. B. ORR, of the firm of Orr and Honeyman, Glasgow, attended, and gave evidence in reference to dried meat in powder, from Australia, specimens of which were laid before the Committee.

Mr. ORR, in reply to a question from the Chairman, said,—I do not know that I have any particular statement to make to the Committee, but seeing that a Committee on Food were sitting, I thought I would send these specimens. I called here this morning, and was asked to attend here this afternoon.

The CHAIRMAN—We had something of this sort here before. We got Dr. Taylor to analyse it, and he reported very favourably on it. Is this merely pounded, or is anything else done?

Mr. ORR—It is dried on plates, by steam. The plates are tinned, so as to prevent any oxide from getting into it, and it is then ground. Nothing is done to preserve it except desiccating it—first drying it and then pounding it. I do not know what the qualities of the other specimens are, and therefore I cannot compare this with it. There are only about three cwt. of it in this country at present. It can be sold at two shillings a pound, and I believe we may reduce the price. Five pounds of fresh meat is reduced to one pound without losing any nutritive qualities? There is no salt with it, but it is simply dried meat; I do not know that it would be desirable, but a greater quantity of jelly could be put into it if wished. This has been exported to Glasgow; there is no regular place in London for the sale of it. We are the agents in Glasgow of the importers in Brisbane. It is made in Brisbane. I consider the mutton to be equally as successful as the beef. I have tried both at home, and find both uncommonly good. I have had some for ten months, and which has been good all that time. I do not know how long these specimens have been made, but they must have been made this five or six months, because they have come all the way from Queensland. We have had letters from ship-captains who have tried it on the voyage to England, and they state that they find it to be very good, and to keep well.

* The subject has already been mooted, and a prize proposed. A second prize will shortly be offered; and it is hoped that an interesting collection will appear at one of the Tuesday meetings in September.

If I could get any suggestion upon it I should be glad, as I am a business man, and not a scientific man.

Rev. J. E. HALL—I think it would be a good thing when the tins are filled to take a piece of paper steeped in a solution of isinglass and put it on the top of the meat. I have seen preserves treated in that way, and it keeps them from getting mouldy, and preserves the flavour most excellently.

The CHAIRMAN—We are very glad to have an opportunity of seeing it, and shall be glad if you will leave some specimens of it here.

Subsequently some specimens were laid before Dr. A. S. Taylor, F.R.S., for examination, who reports as follows:—

“Excepting the appearance there is nothing objectionable in the two samples of dried beef and mutton which you left with me. I cannot discover any acari in either. There is no offensive smell; and I do not find, by operating in a close vessel upon the whole of one parcel for forty-eight hours, that the slightest trace of ammonia is evolved. The odour is like that of dried fibrin and albumen. The colour is peculiar, and rather repulsive, but this, of course, is a matter of fancy or taste, and in the cooked state it would constitute no objection. It consists of fibrous animal matter reduced to powder, containing a small quantity of oily substance associated with it. A portion is soluble in cold water, and this indicates a slight acid reaction to test paper. A larger quantity is dissolved by hot water, while a still larger proportion (fibrin and coagulated albumen) remains undissolved after boiling. The dry powder contains a large proportion of nitrogen and sulphur, such as dried meat would contain. I have not determined the amount of mineral matter contained in it, but I suppose it would not exceed two or three per cent. On the whole, I think it would prove a nutritious article; but unless kept closely shut up in tins, it would be liable to be attacked by acari.”

TWENTY-SECOND ORDINARY MEETING.

Wednesday, May 13th, 1868; THOMAS HAWKSLEY, Esq., C.E., in the chair.

The following candidates were balloted for, and duly elected members of the Society:—

Brooke, William, Northgate-house, Huddersfield.
Waddington, John, 35, King William-street, E.C., and
Hope-villa, Longton-grove, Sydenham, S.E.

The Paper read was—

ON THE VARIOUS METHODS OF LIGHTING STREETS BY GAS, WITH PROPOSALS FOR THE INTRODUCTION OF AN IMPROVED SYSTEM.

By STEPHEN TUCKER, Esq., M.A.

“Non fumum ex fulgore, sed ex fumo dare lucem, cogitat.”—*Horace*.

I very much regret for myself, I still more regret for you, that it has unexpectedly devolved upon me to bring a subject to your notice of which I possess but a literary and anything but a practical knowledge. Indeed, I could have little justification in addressing myself to so many better versed in the matter than myself, if I had not the ulterior object of submitting to your criticism a recent and very ingenious invention—not, I need hardly say, of my own—in connection with gas lighting.

When exploring any new field in science or literature, however much one may be assisted by the recorded labours of predecessors, there is a certain amount of discouragement in discovering, as I have in this instance, that the thing has been done over and over again, and by writers too, whose inkstands I am unworthy to hold. One of my difficulties, therefore, has been to avoid a simple repetition of that already known to you. I must tell the same tale, though perhaps in a different

way; and if I may lay claim to any originality, it will be found in the historical arrangement of my materials, and that, while limiting myself to the terms of my syllabus, I shall hope to show the gradual development of artificial lighting; and as gas illumination, as a general principle, is scarcely half a century old, I must ask you to bear with me while I take a retrospect of the means known to and employed by the ancients and in the middle ages. It is a long and dreary road to travel, but I can promise you a light of some sort all the way.

It is but reasonable to assume that the several means of setting fire to wood and other inflammable substances were known to the earliest of mankind. The first scriptures speak of fire and burnt offerings; and similar expedients for illumination were doubtless adopted when needed. We know that the Egyptians had lamps, and so many of them that (with the early Greeks) they could not only afford to use them for the living, but to bury them with their dead, as symbolical of the soul's immortality. The use of the lamp or light in religious metaphor, ceremony, or parable has ever been remarkable; and even at the present day the burning candle and smoking censor seem to be revered by some of our priests as indispensable to salvation.

Candles are first mentioned by Pliny. Referring to the lost books of Numa, he records how the scribe Terentius discovered the king's sepulchre, and in it a parcel of books tied with candles, which, as they were applicable to such a purpose, must have been made of string or flax, dipped probably in pitch or wax. Some of the earliest candles, however, were made of leaves of papyrus covered with wax or tallow, and so distinguished as *cerei* (wax) and *sebacei* (tallow). From the minute directions he gave to his chaplain, it would appear that King Alfred knew more about candle-making than he did of the baking of cakes; he commanded him “to supply wax in sufficient quantity, and cause it to be weighed in such a manner that when there was so much of it as would equal the weight of 72 pence, six candles were to be made thereof, each of equal length, so that each candle might have 12 divisions marked across it.” It was not, however, till the 15th century that the use of candles became general in this country, and at that time the Company or Guild of Chandlers obtained their charter of incorporation. Companies seem to have been “got up” in these old days just as they now are, whenever demand threatened to out-balance supply. I don't know whether in any sense the Company of Candle Makers was limited, but they must always have been in a state of liquidation. In olden times candles were invariably made by dipping the wick into the melted wax or tallow; and it was not until the 18th century that the *Sieur de Brez* invented in Paris the still existing process of casting them in metal moulds. The candle branch of my subject I found very interesting, but I will here dismiss it, as it cannot strictly be classed with external lighting.

Beacons, open fires of wood and coal, torches, lanterns, first of horn and then of glass, bowls and braziers holding and burning various substances, and lamps, first filled with vegetable and then with other oils, were the means by which public lighting was effected by the ancients, with more or less generality or extravagance, according to their requirements or civilisation.

We have abundant evidence that lamps were common enough in Rome and all Latin cities; and the streets so early as the days of Constantine (A.D. 353) were so far artificially lighted, that Ammianus Marcellinus speaks in evident astonishment of the ease with which conspirators could plot treason:—“*Ubi pernociantium luminum claritudo dierum solet imitare fulgorem.*”

The suitors of Penelope are said to have paid their homage with torches and odoriferous wood burning in braziers, although they might have treated her and regaled themselves with a more modern article—the lamp; the main principle, however, and rude appliances of which remained substantially the same till the invention, in 1780, of M. Argand, of Geneva, upon which no im-

provement of any practical importance has since been made. (Argand's Letters Patent, dated 5th January, 1787—annulled at Revolution in 1793). Public illuminations for the celebration of victories or religious festivals are of great antiquity. One is recorded when the conspiracy of Cataline was defeated by Cicero; but the actual nightly lighting of streets was of very slow growth, the public buildings only being at first adorned with lamps. Jerome refers to a serious dispute maintained for some hours in the streets of Antioch, between "a disciple of Lucifer and one of the orthodox." This lasted till the lamps were lit, when they spat in each other's face and retired,—an easy way of settling religious controversy, which gains in satisfaction what it loses in courtesy.

Eulogius, Governor of Edessa, kept lamps burning throughout the night, and used part of the oil given to the churches for that purpose.

In tracing the further development of public lighting, I cannot do better than quote verbatim the following passage from an early, but nevertheless elaborate and valuable, treatise on this subject by Dr. Letheby, to whom, amongst many kindnesses, I am also indebted for very material assistance in the compilation of this paper.

He says:—"Until very recently, the modern cities of Europe were no better provided for in this respect (street lighting) than the ancient. It is true that statutes were made, and orders proclaimed, to the effect that every citizen should contribute his share to a system of general illumination. This was effected by placing a candle in each of the lower windows of the house, and keeping it burning, from nightfall to the hour of twelve. At first the performance of this duty was optional, but at last it became compulsory; nevertheless, it was at all times so sadly neglected, that the thief and the assassin had abundant opportunities for mischief. Paris was the first city to improve on this condition of things; for in the year 1558, huge contrivances, called 'falots,' were erected in the principal thoroughfares. The 'falot' was a sort of vase filled with pitch, resin, and such like things, in a state of combustion; but it was soon found that this mode of lighting the streets was expensive, dangerous, and inconvenient, and consequently the 'falot' was quickly displaced by the lantern, which was a rude frame, covered with horn or varnished leather. For more than a hundred years this was the plan of illumination generally adopted; and, as may be supposed, the light was too feeble for any useful purpose; indeed, no one of importance ventured abroad after dark without his torch or flambeau. The latter, therefore, became so indispensable to the midnight traveller, that an ingenious Italian, named Laudati, conceived the idea of opening stalls for their hire. He started his business in Paris, in the month of March, 1662, and he managed it so well that he obtained the entire monopoly of the whole city. His charge for a link was from three to five sous the quarter of an hour, according to the rank of his customer. In 1667, Nicholas de Regnio, the first lieutenant-general of police, introduced a still better system of street-lighting. He invented lamps of glass, which, from their resemblance to a bucket, were called *lanternes à seau*. These he fixed in the middle of the streets, exactly in the same way as they are now suspended in many parts of France, by means of ropes or wires fixed at each side of the street, the lamp being suspended in the centre."

If religious discussions were only terminated in London, as we have seen they were at Antioch, by the timely lighting up of the streets, one need not be surprised that they were so rife amongst its inhabitants in the 15th and 16th centuries, for there is little record of any light, save those in Smithfield, which burned to put a stop to them in another sense. The quaint old chronicler, Stow, in his "Survey of London," tells us that "In 1417 Sir Henry Barton, the Mayor, ordained lanterns with lights, to be hanged out in the winter evenings, betwixt Hallowtide and Candlemasse"—a very appropriate season, by the way, for their discontinuance.

Successive mayors kept on "ordaining" the same thing for three centuries, and then the Corporation contracted with a person for the public lighting, for which service he was empowered to levy a tax of 6s. per annum on every householder paying over £10 rental. The City authorities first applied to Parliament for power on the subject of public lighting in 1736, and again in 1744.

Beckmann says, that "Amsterdam was first lighted in 1669, Hamburg in 1675; Copenhagen, 1681; Berlin, 1682; Hanover, 1696; Leipsic, 1702; Vienna, 1704; Dresden, 1705; Halle, 1728; Birmingham, 1783; Brunswick, 1765; Nantes and Marseilles, 1777; Zurich, 1778; and Strasburg, 1779." The name of M. de Sartines should not be omitted, as one specially identified with the subject of public lighting, and under whose influence the reflector lamps were introduced by Laugrin.

As to whom is due the discovery of coal-gas, and more particularly its practical application as a means of lighting, was for long, and with some may be said still to be, a subject of dispute. The very derivation of the word itself has proved a bone of contention amongst the learned; it is, however, I believe, from the Norse "gaesa," to ferment; from which the German "gascht," or "gast," another supposed root of "gas," may be derived. I have also read that some chemists, deliberating as to a name for the new discovery, argued thus—"It is not air—it is not a spirit—let us call it 'gheist' (ghost). At any rate, the term seems first to have been used by Van Helmont, and to denote an uncoagulating spirit. Gas, indeed, may be said to describe any air which exudes from bodies under the influence of heat.

I do not see how we can account for the so-called "perpetual fires" and "sacred lamps," so associated with Pagan superstition, unless we give the ancients credit for having taken advantage of the escape of hydrogen gas from the earth, and in localities where, for that reason, their altars were placed. They must have used gas, although in perfect ignorance of its nature and origin. I take it that the existence of other gases, besides that of which I particularly treat, was known to much earlier philosophers and chemists than those from whom their introduction dates by ordinary repute. The properties of oxygen, for instance, although never generally known till within the last 70 years, were distinctly propounded, as early as 1654, by Dr. Bathurst, Dean of Wells, in his "Prælectio tertia de Inspiratione," in which he describes it as the "pabulum nitrosum, vel spiritus aeris nitrosus." He asserts it to be an essential of life, from which "non hominum solum cæteraque animalia, sed et ipse etiam plantæ vegetari videntur et reviviscere." Four years after this—viz., in February, 1658—Mr. Thomas Shirley communicated to the Royal Society his experiments upon gas issuing from a well at Wigan. The paper is printed in the *Philosophical Transactions* for June, 1667, and is headed, "Description of a Well and Earth in Lancashire taking fire by a Candle approached to it."

It was at Wigan, also, and not improbably at the same place, that the attention of the Rev. John Clayton, D.D., Rector of Crofton, and afterwards Dean of Kil-dare, was drawn to the investigation of the nature of coal gas. Dr. Clayton seems first to have communicated his experiments to the philosopher Boyle (the Hon. Robert Boyle), in a letter dated 12th May, 1688; and although the Dean's discoveries only date from their appearance in the *Philosophical Transactions* in 1739, he is clearly entitled to rank before Dr. Stephen Hales, whose distillation of coal appeared in his "Vegetable Statics" in 1726.

In 1733, Sir James Lowther, of Lowther, sent to the Royal Society an account of "damp air issuing from the shaft of a coal mine near Whitehaven," and of its being collected in bladders and burnt. It is worthy of note that two other members of this eminent family identified themselves with the history of gas. Lord Lonsdale, the descendant of Sir James Lowther, offered to

light Whitehaven, at his own cost and risk, in the earliest days of gas lighting; but the inhabitants were afraid of explosion, and refused the munificent proposal. And the present venerable Earl, when in the House of Commons as Lord Lowther, divided the House, and was in a considerable minority, on the introduction of gas being first discussed.

In 1767, Dr. Richard Watson, Bishop of Llandaff, in his "Chemical Essays" (vol. 2) examined the nature of the gaseous products evolved during the distillation of pitcoal, although he was not, as has been believed, the first to discover its inflammable character after having passed through water. The Bishop was so respectable a philosopher, that he can afford for me to rob him, after the lapse of a century, of this one atom of his reputation. He is the third dignitary of the church recorded by others and enumerated by me, who materially contributed to the elucidation of the important discovery of gas, and it is well that Bishops and Deans of old had their attention drawn to a different sort of lighting to that which distracts their successors now.

It is certainly a remarkable fact that, notwithstanding all these discoveries, experiments, and papers in the *Philosophical Transactions*, it was more than a hundred years after the inflammable property of coal-gas was clearly proved, before it occurred to any one to apply it to some practical use; nor did this come from any scientific source,—William Murdoch, a miner and engineer at Redruth, in Cornwall, astonished the natives in that distinct and distant part of the country, in the year 1792—by lighting his house and offices with gas, and going to and from the mines at night in a locomotive, (another instance of his ingenuity,) also lit by it. Five years afterwards, Murdoch renewed his experiments with success, at Old Cumnock, Ayrshire; and in 1798 constructed the first gas-making apparatus, at the works of Messrs. Boulton and Watt, at Soho, near Birmingham. These works were illuminated by the new principle at the celebration of the Peace of Amiens, in 1802.

Contemporaneously with Murdoch, two men—both of whom disputed, though wrongfully, the priority of invention with him, were working hard in the same field. M. Lebon had fitted up a room, and lit it by gas in Paris—had made proposals for lighting the city, and applied for a *brevet d'invention*; and Mr. Winsor was lecturing upon the subject at the Lyceum Theatre, in London, which he had appropriately illuminated with the new and brilliant agent. In 1805, Mr. Northern, of Leeds, was urging this application of coal gas, and early in that year Murdoch introduced it into the large factory of Messrs. Phillips and Lee, of Salford; and Mr. Lee, when examined by Lord (then Mr.) Brougham before a committee of the House of Commons, upon the Gas Light and Coke Company's Bill, said he had 1,000 burners, and estimated their light as equal to 2,500 candles.

Gas now began to create considerable sensation, though half the civilised world were afraid of it, and a great part of the rest laughed at it. It was only in isolated instances where its advocates could influence its use; but in 1807 the college at Stonyhurst was the first public institution to adopt it, under Murdoch's direction; and Winsor obtained permission to try it in Pall-mall. This gave rise to a squib, which I am very sorry I have not been able to see, as, if I may judge from other effusions by the same author I have seen amongst the king's pamphlets, it would have amused you to have quoted it. It was entitled "Ludicrous Debates among the Gods and Goddesses in a grand council assembled on the proposed destruction of the notorious London Smoke by the use of Gas Lights; dedicated without permission to the National Light and Heat Company, by Obadiah Prim, Esq., M.D., B.A., F.R.S., F.A.S."

About the same time the imperfect lighting of the streets of Paris called forth the suggestions of a-Mr. A. Lucas, who published his *Projet d'Institution d'une Surveillance spéciale de nuit pour la sûreté publique*," but as

Mr. Lucas's system does not seem to have been adopted, it may be described as the "*Lucas a non lucendo*." Mr. Lucas, I find, subsequently published a treatise on the social evil—a subject with which he seems to have been better acquainted. Paris was lighted by gas in 1820. It was not till 1812 that the Chartered Gas Company (incorporated as the Gas Light and Coke Company, in 1810) commenced operations, despite the prejudices and opposition of even the most eminent of scientific men. It was the precursor of the 13 companies now established and flourishing in London alone. Mr. David Pollock was the first governor of the Chartered Company; and Jerdan relates the story of his writing to his friend Dr. Masham (afterwards warden of Merton), asking him to take shares in the new scheme, to which Dr. Masham sent the following curt reply:—

"Believe me, Dear Pollock, I'm not such an ass,
As to fancy that Gaza's the Latin for Gas."

'Gaza,' I need hardly remind you, was the name given to the Royal Treasure of Persia, but I dare say Dr. Masham has often regretted since that he did not act upon David Pollock's suggestion. There is another anecdote of Pollock, which is worth recording; on his becoming so prominent on the gas question, Mr. Baron Bolland wrote of him:—

"Little David of old with a sling and a stone,
Slew Goliath the giant, alas!
If on our little David this task had been thrown,
He'd have poison'd the giant with gas."

In 1812 Mr. Samuel Clegg, who had been a pupil with Messrs. Boulton and Watt, and became the worthy successor of Murdoch as their engineer, introduced gas into various establishments—Ackerman's, in the Strand, being the first. In the *Gentleman's Magazine* for that year, it is shown also that the new scheme had reached the other end of Europe:—"May, 1812, Messrs. Sobolewsky and Horner, of St. Petersburg, have announced the discovery of the process of the French engineer, Bon (*sic*), and of Messrs. Murdoch and Winsor, for extracting gas from wood and coal and applying it to the purpose of illumination. Their greatest difficulty, they say, consisted in absorbing the smoke which exhaled from the gas, and in giving brightness and purity to the flames; for, in all experiments made in foreign countries, or in Russia, the flame was always weak and bluish, not very luminous, and attended by a mephitic smell. After many ineffectual experiments, they at length succeeded in obtaining a clear light from the gas, without any smell, and unaccompanied by any sooty evaporation. They have described their process, exemplified it by experiments to numerous assemblies, and undertaken to light the public national establishments, manufactories, &c."

As an evidence of the progress we have made in the matter of gas apparatus, I will trouble you with a description of what a writer in 1813 calls, "a much more preferable apparatus for producing a light." What the thing was to which this was "preferable" I am at a loss to imagine. He says, "It consists of a handsome box, lined with copper, containing hydrogen gas, confined by water. On turning a cock a stream of the gas issued from it, and is inflamed at the same moment by an electrical spark proceeding from an electrophorus placed as the bottom of the box; a candle or lamp is placed before the flame, by which it is immediately lighted. The cock must then be turned back to prevent an unnecessary consumption of the gas. The process for replenishing the box with the gas is cheap and easy, and is but seldom required. This apparatus would save the expense of a constant light in a bed chamber, and might be used with perfect safety."

The illuminations at the peace rejoicings in 1814 gave to the promoters of the gas movement a great opportunity for display; and although the 10,000 lights arranged at the instance of Mr. Pollock on the Pagoda in St. James's-park were doomed to an accident, it is specially noted, in an account of the day, that "one of

the most ingenious displays was in front of Knight's Gas-light Office, Fleet-street; a tree was formed of laurel leaves, with a profusion of blossoms; the blossoms were of gas light, and their keen and quivering splendour threw every other into comparative obscurity." In the previous year, Westminster-bridge was lit with gas; and Mr. Clegg had to do all the lighting and extinguishing himself, so fearful was everyone of explosion. The parish of St. Margaret's, Westminster, was the first to remove their oil lamps and substitute gas. In 1815 it was adopted at the Guildhall; and between that date and 1823 it became much used, and gradually rose into favour and surmounted prejudice. The Church of St. John the Evangelist was the first in which gas was tried; and Westminster-hall, the avenues to the House of Lords and Commons, the residence and offices of the Speaker, and the Mansion-house were amongst the earliest buildings in which the new system became popularised.

It was estimated that in 1818 fifteen miles of gas piping had been laid in London. The number of miles at the present time can be reckoned by thousands. In 1822 Sir William Congreve calculated that £1,000,000 was invested in gas companies, and advised the allotment of districts, which was effected by Act of Parliament the following year. At that time gas was 15s. per thousand cubic feet, and was reduced in 1849 to its present average price of 4s. It is said that the Westminster Gasworks alone supply 5,000,000 cubic feet nightly; and Dr. Lethby estimates that about 8,000,000,000 feet are annually supplied to the metropolis, of which an eighth is wasted by leakage. So large has grown this great social and commercial fact that the sum expended in gasworks in London alone would have paid a very respectable dividend on the National Debt, and has been calculated at 14s. 6d. a head on the entire population. I must not weary you with statistics, astounding and interesting though they be; to the uninitiated they would be dreadfully dry, to the many present who are masters of my subject they would be needless. By the same rule I need not stop to describe the advantages, or otherwise, of the various burners which have from time to time been introduced. The argand, the bat's-wing, the swallow-tail, the cockspur, the fish-tail, and twenty others, either variations of or improvements on these, have all been minutely described by many writers. But, whatever the form of a burner, its construction should be such that, while it admits sufficient air, it should never admit more than is requisite for the perfect combustion of the gas; and although the size of the jets has been measured even to the fortieth of an inch, I presume I am right in supposing that such dimensions must vary according to the quality of the gas, and that no such minute standard can be fixed or sustained.

Such, then, is a brief outline of the introduction and progress of gas lighting; and, accustomed as we are to it now, whether in or out of doors, we can scarcely believe that, a little more than a generation since, it was practically unknown, and had to force its way against the sneers and the fears of everyone. In the perfect simplicity of its present use we may well recur with wonder to all this opposition, and feel surprise that it was left to an obscure Cornishman to develop one of the greatest improvements of modern time, which had for years been within the reach of the scientific. It is true, as I have shown, that several had formed the most just conclusions as to the capabilities of coal gas, and many had predicted the introduction of an illuminating vapour instead of oil; amongst them Dr. Johnson, who, watching from his window in Bolt-court the bungling of the lamp-lighter of the period, said to some one with him that "the day would come when London would be lighted by smoke." The prejudice against the use of gas exists with some few people of the oil-lamp type to the present time. There are one or two clubs in London to which the gas pipe has not penetrated; and it was not till 1853 that the Haymarket

Theatre was (by the removal of the restriction by the lessor) enabled to enjoy the greater brilliancy and economy of gas.

It needs no argument of mine to prove that which must be patent to everyone—viz., that an article of universal importance and adoption, and in the manufacture, application, and consumption of which a far larger sum of money has been invested than in any other product or undertaking, is one well worthy the attention of those by whose ingenuity its quality can be improved, its price modified, its advantages increased, or its use and appliances economised. My own belief is that we are comparatively as much in our infancy in the question of gas now as they were a century ago. We shall not only have it of a far better quality, but at a less price. We shall be taught how to save all that we now lose by leakage, and even the lamp-posts themselves will be made to do double duty, and become innocuous ventilators to the sewers. I can afford to be a prophet when I tell you that all these improvements have already engaged the attention of such men as Mr. Hawksley, Mr. Barlow, and Dr. Lethby; and whether or not the Government will be able to make themselves masters of the gas companies as well as the telegraphs, the same field will still be open for the thoughtful and the learned.

In lighting and extinguishing lamps we have made some progress towards improvement. The lamp-lighter, although proverbial for his nimbleness, has not now to run from post to post with his ladder, to run up and down, to open and shut lanterns, and apply the flame to the burner. His ladder is superseded by a long stick torch, which is long enough to put through a hole at the bottom of the lantern, to turn the tap and light the gas, as it were, by one movement. It was lately tried to light the lamps by electricity, but this, at present, has been found to be an imperfect system.

The one I have been asked to explain to you to-night aims at three objects of improvement—to abolish the genus lamp-lighter, to simultaneously light and extinguish the lamps, and to economise gas. If it is capable of effecting only one of these it is worthy of your attention, as beneficial to the gas companies, their shareholders, the ratepayers, and the public generally; and I shall recur with great satisfaction to the fact of my having been, in however indirect a way, the means of introducing it to the Society of Arts and the gas world. I may mention as a fact,—though I do not wish to throw it out as a hint—that when, some 50 years ago, Mr. Clegg read a paper on "gas-lighting" to this Society, he received the silver medal. My aim is for your golden opinion,—your approval of the system I am now about to describe; and although prepared to hear many objections, I believe that if you admit the merit of the principle they may all be overcome.

The Letters Patent (No. 2,435) of Mr. Walter Thurgar (who, I may mention, is not professionally connected with gas-engineering, but is a surgeon, at Norwich), sealed 25th February last, are for "Improvements in Apparatus for Regulating the Supply of Gas to Burners." The basis of this invention is the American clock. The central spindle of an eight-day clock revolves once an hour, and has two arms inserted to gear with 48 teeth on an independent plate, which therefore makes its revolution in 24 hours. Of these 48 teeth half are inserted on the upper and half on the under surface of the plate, and so have more liberty to bear upon the arms of the spindle. This independent plate has 96 cogs in its circumference, and its retrogression is thus prevented every quarter of an hour by a small spring-stop, to avoid strain on the mainspring. In this 96-cogged plate is inserted a spindle, connected with the outer or dial-plate, which has two arms, one fixed, one movable. This movable or adjusting arm is for regulating the hour at which the gas should be lit or put out, according to the time of year. The dial-plate, of course, revolves also once in twenty-four

hours, and at the proper time the arm presses one side of the double cam fixed to the tap in the vertical gas pipe. On each side of the tap, and connecting, as it were, the perforations, is a small groove to which I wish to direct your attention, for it is through this groove only when the light is turned off, that sufficient gas escapes to supply the small blue flame, which continues—though invisible—during the day-time. The cam being pressed, as I have stated, turns the tap, and reduces the light to this blue flame, and on the other arm coming round, and in contact with the cam, it lowers the guard, turns on the gas at full, and in effect lights the lamp. The guard (the sole object of which is to protect and hide the small day-light flame) has perforations for air at the bottom, and is connected by a tube with the plate on which the loops of the cam act.

There can be no doubt as to the ingenuity of this machine; and most of those to whom it has been shown have expressed decided opinions as to its value and practical utility. The effect of the principle, if applied generally, would be very striking—the illumination at the same moment, or practically so, of every public lamp, and that, too, at the very moment when artificial light is required, and the extinction of the light in the morning, which, however, would be gradual, and in relation to the gradual consummation of the light of day. When a lamp-lighter commences his beat, he necessarily has to light a great many lamps long before they are wanted—as we frequently see them—and these are all burning, at full cock to waste. By the same rule a countless amount of gas is burnt to waste before it is put out in the morning. I cannot but believe therefore that an apparatus which can be made to light and extinguish in a moment, can fail to effect a great saving in the supply of gas, for the infinitesimal flame it burns during the day (and which has the advantage of preserving an equal temperature in the lantern) consumes no more than a cubic foot in twelve hours, the value of which we may reckon at a farthing.

As regards the far greater saving in the matter of lamp-lighters, I am informed that one gas company admitted that the adoption of this principle would save them £450 per annum on every thousand lamps. Every lamp must now be visited fourteen times each week for lighting and putting out, and once at least for cleaning; while a lamp fitted with Mr. Thurgar's machine need only be visited once in each week, when the man could wind the clock, move the regulating arm forward or backward one hole, as the season may require, and clean his lantern. It is within the mark to say that two men could well do the work of sixteen under the present system, and that, too, by an isolated visit at any hour one day every week. I believe it is estimated that the cleaning, lighting, &c., of each lamp costs from 15s. to £1 per annum. This machine, therefore, at a cost of, say 12s. 6d., would soon pay itself, and is exceedingly unlikely to get out of order. But companies do not like to go to large outlays, even if favourably disposed to the introduction of evident improvements; and although, in this instance, their expenditure would soon be recouped, the difficulty could be met by their renting the machines at a stipulated royalty, the patentee undertaking to wind, clean, and repair. The shade which would be cast by the machine on the pavement below is one objection that has been raised to it. I do not see that the fault can be weighed against the many advantages which the principle would secure. All future lamp-posts could be contrived to enclose the machine; and till then I may argue, as the advocates of the carburettors argued, that the "shadow cast is not absolute, but merely relative, and that the real practical detriment to the efficiency of the light is not considerable."

The occurrence of a London fog must also be provided for, and, as at present, each lamp must then be visited; and as the apparatus must not be interfered with, the man would have, in the usual way, to light a second burner of the ordinary kind, attached

to the supply pipe below its connection with the machine, which burner could be raised and used in such rare emergencies. It was at the instance of Lord Ranelagh, who, taking a praiseworthy interest in matters of public utility and benefit, was desirous of helping the views of his countryman, Mr. Thurgar, that this invention was brought under the notice of Lord John Manners, the first Commissioner of Works. Lord John directed a trial of the machine to be made, and one was fixed in one of the outer passages of Somerset-house for that purpose; subsequently to this, by the direction of the master (Professor Graham), a machine was also fixed at the Mint, over the porter's lodge. These machines have been ever since working, viz., for three and four months respectively; and I may mention that during a violent wind storm which occurred some three months since, although two panes of glass of the lantern in Somerset-house were blown in, the guard of Mr. Thurgar's machine preserved the little blue flame alight. The only fault that has been found with these two machines is that they have not been strictly regular in the time of illumination. Mr. Thurgar therefore directed his attention to this point, and by the skilful and scientific arrangement of his present dial-plate and regulator, has successfully overcome the difficulty, and, I think, completed the efficacy of his invention. He found that an arbitrary and undeviating adjustment of the regulating holes would not make the machine work in accordance with the caprices of the sun and moon, and after careful calculation he devised an arrangement of 23 holes, at varying distances, into which the regulator is moved one by one, say from the 8th of January to the 11th of June forwards; then having been stationary till 9th of July, backwards to 10th of December, where it again remains till January 8th. This may seem very complicated when heard in description, but, like everything else, is simple enough when you know it. Although, therefore, the tests at Somerset-house and the Mint have been highly satisfactory as exemplifying the principle of Mr. Thurgar's invention, and the durability of the machines, which are infallible in the working, they are wanting in the mere recent and important adjunct of his improved dial-plate and regulator. The clocks also are now made to wind at the side, and have been in other respects much improved since the two I refer to were put up.

Mr. Thurgar takes the bold but effectual step of attacking you scientific gentlemen of the gas world with your own weapons—of asking you to see and criticise his invention. He may, at least, lay claim to novelty; for, with the exception of Mr. Malam's early invention of the meter, I am not aware that clockwork has ever before been employed in gas apparatus, certainly not as a means of lighting and extinguishing burners. I am sensible of the imperfections with which my introduction of this machine to you has been characterised, but with you, who will understand its object and application so much better than myself, I have the satisfaction of reflecting that the interests of the inventor will not suffer, and that you will give to the subject that impartial attention and investigation which every invention tending to great economy and public good demands and should receive.

DISCUSSION.

Mr. FORD asked how long the apparatus would last, and whether the light would not be liable to go out during the day in stormy weather?

Mr. HEATH thought the little groove through which the gas passed, when the tap was turned off, would be liable to get filled up with the grease used for lubrication. A similar arrangement had been in use for some time in bakers' ovens, and this was found to be the case, so that the plug had to be taken out and cleaned.

Mr. JONES said Mr. Denison, President of the Horological Institute, had recently published a book, in

which he referred to a somewhat similar arrangement as being in use for the illuminated clock at Westminster, and also for the Town-hall clock at Leeds. Mr. Denison spoke approvingly of this automatic action, and thought it was applicable to public lamps; but his (Mr. Jones's) impression was that the apparatus would require considerable attention to keep it in order. For his own part, however, he hoped it would be adopted, as it would probably lead to considerable activity in the watch and clock-making trade.

Mr. PEARCE said he had understood from the paper that this was the first application of clockwork to the lighting of lamps, but he believed it had been applied to the lighting of oil lamps in France long ago.

Mr. BOTLY said he could corroborate what was said in the paper as to the waste of gas occasioned by the lights not being lighted and extinguished at the proper time. In his own neighbourhood he believed that on an average the lamps were lighted from an hour to an hour and a half before sunset, and remained so till about the same time after sunrise in the morning; therefore if they could all be lighted and extinguished just at the proper time a great saving must be effected.

Dr. LETHEBY had listened with great pleasure and interest to the paper, which contained many matters entirely new to him. Passing over the historical part, he would make one or two practical observations on the little machine which was introduced to their notice, and which was certainly highly ingenious. The first question which presented itself was this, was there any occasion for such a machine? Considering that at the present moment gas companies were pressed upon in all directions with regard to the economical management of their affairs, he should say there was the utmost necessity for the application of any instrument which might help to economise and reduce the large expense to which they were put in respect of public lights, for the good old days were long passed when (as the Chairman might remember) the price of gas was 13s. a thousand feet. In conjunction with Mr. Haywood he had made an inquiry for the purpose of ascertaining the successive reductions in the price of gas, and he found that in 1827 the price charged was 15s. per thousand; during the succeeding three years it came down to 13s. 6d.; then for two years it stood at 12s. 6d.; for four years at 10s., and then for seven years, from 1837 to 1842, at 9s.; two years it was at 8s.; then came three years at 7s.; one at 6s.; and in 1849, the memorable year to all conversant with the history of gas-lighting, when the agitation in the City led to the establishment of the Great Central Gas Company, the price suddenly fell to 4s., at which it had since remained, but there was legislation at present going on which would probably lead to an increase of illuminating power and diminution of price; there was, therefore, every possible inducement to the companies to turn their attention to any method by which a saving might be effected in the cost of public lighting. There were in the City 2,884 lamps, which burned on an average about twenty thousand feet per annum, that being a fair average of eleven hours a day, at five feet per hour. These public lamps cost the City at present about five guineas per lamp, being a total cost of something like £15,000 per annum. The cost of lighting these lamps and keeping them in repair was about 15s. each per annum, of which about 12s. fell to the lamplighter; one man could only keep in order between 80 and 90 lamps, and his wages would average not quite 20s. per week; and this amounted to £1,730 a year. By the use of such an apparatus as had been described, one lamplighter would do about the work of three, and would thus be enabled to attend to 270 lamps—he did not think they could go beyond that. The lamps would require cleaning at least once a week, and he did not think one man could clean more than 45 a day, or between four and five an hour, working ten hours a day; this would enable him, working six days a week, to attend to 270 lamps, and if this were so there would be a saving in

the wages of the lamplighters of about £1,153, out of £1,730. That was a great reduction, and offered a strong inducement for the matter to be entertained. There would also be an economy in the amount of gas consumed, for, as they had heard, there was undoubtedly a great amount of irregularity in the times of lighting and shutting off the gas. Then came the question, who would be benefited by this economy? For those who would receive the advantage ought to be the parties to apply the invention. Would the companies be benefited? He thought the history of legislation on the subject of gas-lighting showed that the local authorities would derive the benefit from the application of this apparatus, and not the companies. With regard to the disadvantages of the apparatus, in the first place there was the cost of the instrument. They had not yet heard the cost at which it might be rented, but supposing even there were a large economy in that respect, there was another matter which appeared to have been lost sight of, viz., the cost of the application, for not one of the lamp-posts at present in use would permit of the adoption of the apparatus. If they were applied as carburettors and regulators had been applied, there would be a considerable shadow cast under the lamp-post, which the police authorities would say was a very dangerous thing for the public. Again, if they were affixed, as was proposed, to the present lamp-posts, they would be so exposed as to furnish a strong temptation to thieves. The lamp-posts, therefore, would require to be altered, so that the instrument might be placed inside; but this, of course, was not an insuperable difficulty. He should be very glad to see this invention lending its aid to the abolition of the present ugly lamp-posts, for the time was come when they should be replaced by something better. As had been said, they might be utilised, not only for lighting the roads, but also for ventilating the public sewers, and perhaps in other ways also. They wanted a lamp-post which would hold a governor, a meter, and, he ventured to add, although it might not accord with the views of some who were present, a carburettor. But there was yet another difficulty, he feared it would be an uncertain instrument. A question or two had already been asked, which would seem to indicate that the flow of gas during the day along the little channel might be impeded by grease. There would be an imperative necessity, therefore, if this invention were adopted, for visiting every lamp at night. Already among the 2,884 lamps in the City, there were 926 cases of going out, or 32 per cent., which was looked upon as a very serious thing, and the attention of the police was constantly being drawn to it, and complaints were made. The consequences, therefore, would be very serious, if by the use of this instrument they in any way imperilled the lighting of the public way. Then came another difficulty—how arrangements were to be made for foggy days. As he understood, the proposition was to have an extra jet in each lamp, but this, he feared, would not only be expensive, but would be liable to leakage. There were, therefore, these serious objections to the invention, but though he did not say they were insuperable, they would require the careful attention of practical men before the plan could be adopted. At the same time the instrument was unquestionably very ingenious, and, if these difficulties could be overcome, would be of great public benefit.

Mr. E. H. THORMAN said he had spent some time over this instrument with the inventor, and was exceedingly pleased with it in many respects; at the same time he found all the faults he could with it, many of which had already been mentioned by Dr. Letheby. It was not unfrequently the case in his neighbourhood that ten or twelve lights in a row would be turned out by some mischievous person, and this, he apprehended, would have the effect of injuring or destroying an apparatus of that kind; and he apprehended that in the suburban districts the apparatus would be sometimes stolen. Then, again, he thought too much had been taken for granted

as to the saving which might be effected. He did not agree that the lamp-lighters might clean the lamps once a week only; he should find fault if his lamps were not cleaned twice a week. If the invention could be practically carried out it would be a great advantage, and it would certainly be a fine thing to see a long line of lamps all lit up at once, but he was afraid such a thing would not just yet be realized. He did not concur in the idea of utilising lamp-posts for ventilating purposes, inasmuch as he thought they were at present much too high; the light should be brought down from a height of 10 or 11 feet to 8 ft. 6 in., in order to give light to the passers by. He had been much struck by the advantages of this plan in France, particularly at the railway stations.

Mr. CAMPIN thought the instance, which had been mentioned, of lighting oil lamps by means of clockwork must have been very different from the present invention, which was not really for lighting lamps, but for instantaneously increasing the supply of gas at night, when more light was wanted.

Mr. C. F. T. YOUNG thought the amount of work required from lamp-lighters, up to a very recent period, was anything but creditable to science, considering the labour in proportion to the result attained. Supposing the lamps were 10 feet high, the man formerly had to carry a lamp about with him, to place it against each lamp, ascend about 5 feet, take his small lamp, and kindle a little flame about as long as his finger. If he lighted eighty or ninety lamps, taking it that he had to ascend and descend 5 feet each time, that gave 800 feet as the space through which he had to carry his body, weighing, probably, 130 lbs. This had, certainly, been improved to some extent by the introduction of a long pole, with which to light the lamps; but he was not at all satisfied that that was the best possible arrangement, or even that the one now proposed was everything that could be desired, although he believed the idea was a good and practical one. He thought there might be in each long row of lamps a tap, on the ground level, communicating with an apparatus at the corner of the street, with clockwork or an electrical apparatus, by which each line of lamps could be worked very easily. He thought something of that sort would carry out the idea of automatic lighting better than the invention now brought before them. Of course, nothing was perfected at once; but he had no doubt this invention might be made the starting-point for something better.

Mr. VARLEY called attention to several ways in which gas might be economised. More than seven years ago, when the use of flat-flamed candles was universal amongst certain classes of workmen, it was shown that by bringing two flames near each other the light was much more than doubled, and he apprehended the same principle would apply to gas burners. Again, in the ordinary burner the purity of the upper part of the flame was affected by the air which fed it passing through the under part; if the jet were placed horizontally every part of the flame got a supply of pure air, and a better light resulted.

Mr. PEARCE said that a long time ago a plan of lighting lamps by clockwork was invented, a stream of hydrogen gas being turned on to a small piece of spongy platina, which immediately ignited and lighted the lamp. He thought this plan could be easily applied to street lamps.

Mr. BISHOP had seen that plan tried a considerable time ago, but the apparatus so soon got out of order as to be useless for practical purposes. With regard to the blowing out of the light, that was easily obviated. He, like others, had been used to turn down the gas, and often found it went out altogether, but on applying at the bottom of the burner where the current of air entered a copper wire webbing, he found this was effectually prevented.

Mr. HEATH asked if any provision was made by the inventor for cleaning out the burners if they became

dirty. In dusty weather they very often became clogged, and the lamp-lighter had to clean them out before the gas would light. He felt satisfied that if such a small blue flame as was contemplated were kept alight only by the usual pressure during the day of about three-tenths, it would very often be put out by accidental causes such as had been alluded to. He suggested that instead of the groove formed in the plug of the cock, an independent channel should be provided for the passage of the gas by day, terminating in a jet close to the ordinary burner; by this means the danger of the channel becoming choked by grease would be avoided.

Mr. SCHOMBERG wished to know the opinion of the Chairman, whether the little instrument under their notice could be kept clear from their troublesome enemy naphthaline; and whether, if there should be a deposit of naphthaline, the cleaning of such a piece of mechanism could be safely left to the ordinary lamp-lighters.

Mr. TUCKER, in reply to the observations which had been made, said he thought he could answer some of the objections which had been raised. It was known to those acquainted with machinery that the American clock would work infallibly for years, and these machines had been at work for some months without showing any signs of getting out of order. As to the cleaning, that could very easily be done, whenever required, by taking out the tap. As to the machine having been anticipated by that alluded to by Mr. Pearce, he conceived it was not the same kind of machine at all; and he still believed this was the first application of clockwork to the lighting and extinguishing of gas. As to the comparative waste of gas, he conceived it was out of all proportion greater where, as was said to be the case, it burned an hour or an hour and a half morning or evening or both, when artificial light was not required, than where it only remained on for twelve hours in the shape of a small blue flame. He had already stated that the cost of the apparatus was 12s. 6d., and it could be readily applied to the existing lamps. As to the instruments being stolen, he thought that was not likely, though he was ready to bow to the authority of his friend Dr. Letheby in that matter. This danger might not be altogether imaginary in rural districts, but the metropolitan streets must be guarded against any chances of such an occurrence. Moreover, if it were necessary the lanterns might be locked. He had suggested a second burner to meet the emergency of a foggy day, and he did not think that would add materially to the difficulty or expense. As to the flame being blown out, he had in the paper given an instance, and he thought a convincing one, that this need not be feared, the flame having remained burning in a gale of wind so strong as to break two panes of glass in the lantern.

The CHAIRMAN said they must all have listened with great interest to the paper, which was partly historical and partly practical. Leaving the former portion, he would make some few observations on the practical part, especially as some questions had been put to him, which he would endeavour to answer. One question was, what would be the effect of the naphthaline which was deposited, particularly in some states of weather, and in particular stages of manufacture, because even at present the lights were often liable to destruction from this cause. His honest opinion was that these lamps would be extinguished, for the little connecting aperture by which the small blue flame was kept up, would, under certain circumstances, be completely stopped up. If, then, that and other accidents were to occur, by means of which there would be at times an interruption of the public lighting, he did not see that the introduction of this apparatus would be the means of reducing the attention required to be given by the lamp-lighters, or the number of persons who had to pay that attention; and, therefore, he did not conceive there would be any economy in the matter of wages. But, on the other hand, there might be some additional expenses, because the whole apparatus—however ingenious—was one of some delicacy, and one

which would necessarily require some attention, much more, indeed, than the writer of the paper seemed to imagine. That attention must be given, not to remedy defects in the public lighting, but to prevent them, and attention of this sort must always be more serious than that of merely a remedial character. The public—he did not say they were wrong—were very intolerant in such matters, and would not submit to have an intermittent light; and if the lighting were to be accomplished by any automatic means, the result must be at least as perfect as that attained by the hand of the lamp-lighter; but he did not imagine any apparatus of this kind would be so perfect and certain in its operation as the men. As to the question of cost, he had no doubt that these instruments might be made as cheaply as 8s. each if machinery were introduced for their construction; but then they must be kept in repair, and replaced when worn out, and they had as yet no experience of what the cost of maintenance and renewal would be. Again, although the little blue flame might be kept up by the consumption of a quarter of a cubic foot an hour, or at the cost of a farthing a day, that would amount to 7s. 7d. a year; and if to that were added the cost of maintenance and renewal, and of the lamp-lighter's attention, he did not see that any saving whatever could be effected. There was another consideration, however, which affected the subject in an economical point of view, and that was the lighting and extinguishing of the lamps at exactly the proper hour. Coming into London, as he often did, by the mail train in the morning, he was aware that the defects of the present system which had been alluded to occurred only too often, and that the gas was not unfrequently burned for a hour and a-half longer than it ought. That, however, only occurred during a small portion of the year, and when it did occur in the summer months it arose from negligence in the superintendence of the lamp-lighting department. It was the practice in well-managed undertakings for the men to receive and deposit their ladders and torches at a particular place, so that it was known to a moment when they began and when they left off work, and it was simply for want of proper superintendence if there were more than half an hour's waste per day at any period of the year. That of course was a matter under the control of the gas companies; and if, as Dr. Letheby had said, the gas companies were likely to be put under greater restrictions, so as to enforce upon them more rigid economy than they had yet been in the habit of exercising, of course they would look to these matters, and allow no irregularity in the conduct either of the lamp-lighters or of those who superintended them. Having said this much he must add that he regarded this as a most ingenious instrument, and if it were not applicable to public lamps, it would be perfectly so in a great number of other instances, and under other circumstances. He believed it might be extensively used for many private purposes in connection with large buildings and so on, and therefore they were much indebted to the inventor of such an apparatus. They were also indebted to Mr. Tucker for the interesting paper which he had prepared for the purpose of bringing the invention before them, and he therefore begged leave to move a vote of thanks to that gentleman accordingly.

A vote of thanks to Mr. Tucker was then passed and acknowledged.

Fine Arts.

ANNUAL EXHIBITION OF WORKS OF LIVING ARTISTS IN PARIS.

The *salon* opened on the accustomed day, the 1st of May, with the largest collection of works of art ever seen within its walls, and, there is little doubt, the largest ever collected in any place at one time. The catalogue contains no less than 4,213 entries, consisting

of 3,389 paintings and drawings, 522 specimens of sculpture and medal engravings, 63 architectural designs, and 236 engravings and lithographs, the total being nearly one-third larger than that of last year. The *salon* of last year lost, however, much of its interest for exhibitors and proprietors of works of art on account of the greater attraction of the Universal Exhibition; a fairer standard by which to measure the extent of the present collection is that of 1866, which was itself a full year; the result of such comparison shows an increase this year of 775 paintings and drawings, 132 objects of sculpture and medal engravings, 18 engravings and lithographic works, with a decrease of 12 in architecture—total increase above 900. Only those well accustomed to large collections can form an idea of the extent of space occupied by four thousand works of art.

The number of works in the Exhibition is, however, of little consequence, except as showing the activity of art, and as supplying a large field for study—the quality is the grand point. Great works are rare, and there is scarcely one which can be singled out as marking great genius or originality; but if there be no extraordinary emanation of genius there are very many evidences of undoubted talent, and it certainly was the general impression amongst a crowd of artists and critics on the opening day, that the level was higher than usual, and that the number of very poor works was pleasingly small. This is the more remarkable and satisfactory, inasmuch as it is understood that the Jury of Admission exhibited great indulgence, and excluded no work which, in their opinion, exhibited laudable industry and tolerable success.

The liberal system of election adopted for the jury must therefore be regarded as an eminently successful experiment. The names of the two-thirds of the members of the jury elected by the artists themselves was given in the *Journal* of the 10th of April, and no change occurred with the exception of the substitution of M. Ph. Rousseau for M. Gérôme, who was absent from Paris. The remaining third, appointed by the administration of the department of the Beaux Arts, consists principally of well-known art critics or connoisseurs, thus introducing another new element, and a very important one, that is to say, a number of judges free at once from all party and technical prejudices. This official list is composed as follows:—In painting and drawing, MM. Alfred Arago, Charles Blanc, Cottier, Théophile Gautier, Lacaze, and the Marquis Maison. In sculpture and medal engraving, MM. Bonnassieux, Michaux, De Saint Victor, and Eudoxe Soulié. In architecture, MM. Boeswillwald, Albert Lenoir, and Du Sommerard, curator of the Museum of the Hôtel Cluny. In the section of engraving and lithography, MM. Adalbert De Beaumont, Vicomte Delabore, conservator of the Department of Engravings in the Bibliothèque Impériale, and Eudoxe Marcille. MM. Robert-Fleury, Dumont, Duban, and Henriquel, all members of the Academy of Beaux Arts in the Institute of France, were elected respectively presidents in the four sections; and the Comte de Nieuwerkerke, as superintendent of the Fine Arts, presides officially over the whole.

The collection which is now open to the public for six weeks, must be pronounced as almost entirely wanting in historical, religious, or poetical works of the highest class; the number of large military pictures is certainly smaller than usual; landscapes and animals are more rare than formerly, and the number of portraits rather below the average; official subjects are few in number, and startling nudities are much less remarkable than they have been of late. The great mass of the pictures exhibited belong to the class of *genre*, including many graceful subjects drawn from mythology and fable.

Like its predecessors the Exhibition shows to what an extent drawing has become an integral part of the national education, the small number of figures that exhibit glaring anatomical defects or want of life-like reality

being truly surprising; and, generally speaking, there is an improvement in colouring—more brightness, and fewer attempts to excite astonishment by almost impossible harmonies. Some few artists still seem to imagine that one of the greatest achievements is to paint half a dozen reds one upon the other, or a white dress upon a white ground; but, generally, there are fewer glaring eccentricities of this kind than usual, while there are certainly more true examples of brilliant colouring. In this respect the French school is certainly undergoing an important change; Delacroix, Decamps, Diaz, Troyon, Rousseau, and others, have revolutionised the chromatic theories of the old Academic school.

There is another very promising fact to be noted with regard to the present and recent exhibitions—the contributions of young painters who have won the Grand Prix of Rome are decidedly of a higher character than they were. This may result from the new system adopted in the *École des Beaux Arts* during the last few years, taken in connection with the fact that these promising painters have been encouraged of late to take part in the annual exhibitions, which offer them a much wider public than the exhibition of the works sent by them from Rome in the gallery of the schools only.

The Great-room, or *Salon carré*, contains the most remarkable works of the exhibition, together with official subjects and portraits, and is the only one that can well be examined thoroughly on the opening day. The gems are rare this year; Pils and Meissonier, Hamon, Hebert, and other well-known names are absent from the catalogue altogether. Cabanel only contributes two portraits of ladies, excellent works of their kind, but not of general interest, and therefore not placed in the Great room; and the brilliant forest scenes of Theodore Rousseau are gone for ever. The most remarkable work in the room is that of M. Gérôme, who has been voyaging in the East, and presents us with a Jerusalem treated in an original and remarkable fashion. The foreground is the Calvary, covered with huge round stones bathed in sunlight. M. Gérôme has not dared to paint the scene of the Crucifixion, but the shadow of it lies on the stony hill, while a number of spectators view it from a distance; and beyond the valley, over the tree tops, lies Jerusalem. The work is somewhat out of the painter's former range, especially as regards the atmospheric effects, and must add greatly to his reputation. M. Gérôme has another work in the exhibition, but we have not yet found it.

Gustave Doré has a remarkable work called the "Neophyte," a row of grey monks at prayers, the almost effeminate head of a young one contrasting finely with the rubicund, white-bearded, or servile faces of the elder brothers; it is scarcely a picture, but it is a fine study of heads.

The place of honour is occupied by an imperial group—Louis Napoleon, the Emperor of Russia, and the Prince of Prussia, with their suites, on horseback, by a Prussian artist, whose name has escaped us; a good, bold work. Over this is a remarkable picture, by a Bohemian artist, named Cermak, "Christian girls being carried to Adrianople for sale by Bashi Bazouks." "The Four Seasons," a pleasing work, by Smits, a Belgian; two pretty pictures of the time of the First Napoleon—"A Scene at Milan in 1796," by Masse, and "Madame Recamier and Lady Georgina Gordon, afterwards Duchess of Bedford, receiving a lesson in the gavotte, from the famous dancing-master Vestris the Younger," in the presence of a party, amongst whom are the Duchess of Gordon, Lord Holland, and Fox; two pictures form a strange contrast to the brilliant female faces, the silks, satins, and embroidery of the preceding; the first is an effective though curious view of "Verona by moonlight," painted almost in monochrome, by a Bremen artist, named Hennings; the second the "Sahara," by Guillaumet, an artist of great ability in a peculiar line; within very moderate limits the interminable sand lies in shallow waves beneath a burning, hazy sky; the skeleton of a

dead camel, and a few wild flowers in the foreground, a caravan disappearing in the glare of the setting sun in the distance, nothing more, but the soil and the atmosphere are rendered with a masterly hand, and crowds of connoisseurs bear witness to the artist's success. A brilliant landscape, by M. Hanoteau; a finely-painted interior, the "Sistine Gallery in the Vatican," by M. Naolet; a bold design for a ceiling, representing the "Birth of Minerva, all armed from the brain of Jove," by M. Mazerolle; a painful picture of the "Visit of the Empress to the Cholera Hospital at Amiens;" and a bright picture, by a Prussian artist, named Heyden, of "The two Princes meeting after the battle of Koningsgratz," complete the list of the chief works in the great central room.

The arrangement of the rooms deserves a few words. The system of moderating the light by means of false ceilings suspended in the centre of the rooms has been again adopted in all but the large square room, but these canopies are lighter than formerly, seem transparent, and the effect is good; in the large room a white awning, raised in the centre like a tent, is adopted, and the pictures here also are well seen though the moderation of the light is perhaps scarcely sufficient for a bright day.

The number of foreign exhibitors is very considerable, though many of these belong to the French school as pupils of French masters; but we are sorry to see so few English names in the catalogue. The only English pictures we have yet seen are one by M. Calderon, "The return of a knight after victory," and a charming autumnal picture of ferns beneath forest trees, at once rich and sober in treatment.

The central area of the building is converted into a charming geometric garden, containing a collection of beautiful flowers and plants, the show of the Horticultural Society of France; there is a good exhibition of roses, some beautiful orchids, and a very fine collection of foliage plants; as regards cut flowers, variegated pansies and tulips seem for the moment to be the chief favourites. The sculpture is arranged in the garden, a few large works occupying central points, and the statues, busts, and bas-reliefs against the surrounding wall. Altogether the exhibition is very brilliant, and there is scarcely a work of all the four thousand that is not fairly placed; this is not an every-day achievement.

EXHIBITION OF WORKS OF ART AT PAU.—The success of provincial exhibitions in France is most encouraging for artists. That of Pau has just closed, and we have the results as regards sales. The authorities of the town have purchased the *Struggle at Novillos*, by M. Worms, which was to be seen at the great Paris Exhibition last year, while the Society for the Encouragement of Art and private individuals have bought more than fifty works. The latter list includes pictures of all classes, half a dozen bronzes, and two works in terra cotta.

Manufactures.

INTRODUCTION OF STEAM PLOUGHING INTO FRANCE.—During the late Universal Exhibition in Paris, as the readers of the *Journal* are aware, great interest was taken by agriculturists, and careful trials made of steam-ploughing machinery; the inquiries and experiments then made have not been unfruitful; several rich proprietors have introduced steam ploughs on their estates, but the other day the steam plough may be said to have made its triumphal entry into France. On the last day of March last, some ten thousand farmers assembled in the plains of Berry to witness the inauguration of steam ploughing. A steam plough, purchased by MM. Dubois, Suard, and Cie., of Messrs. John Fowler and Co., awaited the benediction of the Bishop of Bourges. The enterprising firm named above is said to include several of the best friends of agriculture in France.

The object of the company is to introduce a steam plough into each district where labour is difficult, such as the Landes, Gascony, Brittany, the Sologne, and Berry, and to establish a fixed tariff of prices per day and per acre, so that each farmer may avail himself of the steam labourer if he please. The rate at present fixed is 22 francs per hectare, little more than seven shillings per English acre, and the applications are said to be numerous. The proceedings terminated with a grand banquet of 160 covers, at which the préfet of the department, and many of the most influential persons in the district were present. It was announced by M. Cornu, Vice-President of the Agricultural Society of Châteauroux, that the Emperor had, at the instance of the president of the society, presented a gold medal to MM. Dubois, Suard, and Cie., for their patriotic action. Enthusiastic speeches were made, and amongst the toasts drunk was one to the memory of the late Mr. John Fowler.

PRODUCTION OF FLAX AND HEMP IN ITALY.—The production of flax in Italy is estimated at about 135,000 quintals, and that of hemp at 500,000 quintals; in all 635,000 quintals. The principal varieties of hemp cultivated in Italy are the common hemp (*Cannabis sativa*), the Chinese, and the Giant hemp, the stalks of which are sometimes as much as five metres in height. The imports and exports of flax and hemp in straw, tow, and fibre, both raw and combed, from 1862 to 1865, were as follows:—

<i>Imports.</i>		
	Quintals.	Frs.
1862	12,659	1,220,000
1863	26,743	2,490,000
1864	14,067	1,330,000
1865	14,366	1,394,000
Average....	16,959	1,610,000
<i>Exports.</i>		
	Quintals.	Frs.
1862	139,199	13,266,000
1863	132,507	12,274,000
1864	151,495	14,868,000
1865	204,932	20,886,000
Average....	157,033	15,324,000

About three-quarters of the exports from Italy are to Austria, and the greater part in a raw state. The following is the trade in rope and cordage:—

<i>Imports.</i>		
	Quintals.	Frs.
1863	10,831	745,000
1864	13,133	1,214,000
1865	9,427	675,000
Average....	11,130	878,000
<i>Exports.</i>		
	Quintals.	Frs.
1863	11,584	1,375,000
1864	14,769	1,769,000
1865	19,715	1,830,000
Average....	15,356	1,658,000

The spinning of flax and hemp is chiefly carried on by hand; there are very few establishments where machinery is used. The three most important spinning mills are in Lombardy; the first at Cassano, the second at Villa d'Alné, in the province of Bergamo, and the third at Melegnano; they contain in all 14,120 spindles, of which 1,088 are for retwisting; they employ 980 persons (245 men, and 735 women and children). The wages are from 25 to 45 centimes per day for the women and children, and the men earn from 1.32 to two francs per day. The quantity of flax and hemp used at these establishments is 12,500 quintals, from which are produced 9,000 quintals of threads of all kinds. A great

part of the hemp comes from Romagna, whilst the flax is nearly all grown in Lombardy. To this may be added the work of 300,000 peasants, who are engaged in spinning 150 days out of the year. Taking their earnings to average 15 cents. per day, the total produce may be estimated at 6,330,000 francs per annum. At Bologna there are two establishments for spinning hemp; they work about 7,000 quintals of hemp, and produce 5,000 quintals of yarn. The production of yarn in Italy does not equal the consumption in that country, and a great quantity of the raw material that is exported returns again as yarn from England and France. The exports of this article do not bear any proportion to the imports.

FLAX AND HEMPEN YARNS.

<i>Imports.</i>		
	Quintals.	Frs.
1862	16,297	4,316,000
1863	27,224	7,150,000
1864	40,420	10,504,000
1865	34,358	9,116,000
Average....	29,575	7,772,000
<i>Exports.</i>		
	Quintals.	Frs.
1862	1,749	444,000
1863	2,266	632,000
1864	3,423	880,000
1865	4,728	1,199,000
Average....	3,042	789,000

These exports are nearly all to Austria. Upwards of 120,000 looms and 171,000 weavers are employed in weaving linens, and their produce is estimated at 60 millions of francs annually. In Piedmont and Lombardy there are several establishments with power looms. The greater portion of the fine linens are imported from France and England, and are very considerable; whilst, on the other hand, the exports from Italy are insignificant, as will be seen as follows:—

<i>Imports.</i>		
	Quintals.	Frs.
1863	11,145	6,836,000
1864	16,091	8,778,000
1864	17,535	9,246,000
Average....	14,924	8,287,000
<i>Exports.</i>		
	Quintals.	Frs.
1863	7,168	2,785,000
1864	5,780	1,859,000
1865	4,049	1,647,000
Average....	5,666	2,097,000

The exports and imports of other products of flax and hemp, such as haberdashery, buttons, trimmings, galloons, lace, etc., were as follows:—

	Imports. francs.	Exports. francs.
1863	1,117,000	486,000
1864	852,000	404,000
1865	1,264,000	763,000
Average....	1,078,000	551,000

The total of the exports and imports of flax and hemp, of all kinds, both raw and manufactured, was as follows:—

	Imports.	Exports.
1863	18,345,000	17,552,000
1864	22,678,000	19,780,000
1865	21,696,000	26,325,000
Average....	20,906,000	21,219,000

A special manufacture is carried on in Sicily for making a kind of cord from the fibres of the dwarf palm. It is chiefly carried on by women and prisoners, and the average produce may be estimated at about a million and a half of francs annually.

Commerce.

ITALIAN WINES.—The total production of wine in Italy is estimated at 28,879,908 hectolitres (about 63,535,846 gallons) of the value of 1,052,740,000 francs (£42,109,600). The following is the production, divided amongst the various provinces:—

	Quantity. Hectolitres.	Amount. Francs.
Piedmont and Liguria	3,800,412 ..	136,800,000
Lombardy	1,228,144 ..	46,670,000
Venetia	2,368,045 ..	87,600,000
Emilia	5,013,933 ..	180,500,000
Umbria	1,724,149 ..	58,600,000
The Marches	2,447,421 ..	83,200,000
Tuscany	1,500,000 ..	58,500,000
Neapolitan provinces	2,101,712 ..	69,400,000
Sicily	8,188,092 ..	311,150,000
Sardinia	508,000 ..	20,320,000
Total	28,879,908 ..	1,052,740,000

The principal wines in Piedmont are the Barbera, the Nebbiolo, the Barolo, the Brachetto, the Gattinara, the Grignolino, the Malvaria of Asti, the Passeretta, the Agliano, the Caluso, and the Moscato. These wines are exported in considerable quantities to South America, where they find a ready sale. In the Ligurian provinces the principal wines are the Dolcetto, the Pignolo of Neive, the Malvasia of Grinzano, and the Dinazzano. In Lombardy, the San Colombano, the Monterobbio, the Sassella, and the wine called Inferno, grown in the Valtellina, which is exported to Switzerland and the Tyrol. In the province of Modena the Lambrusco, the Fiorano, and the Scandiano, are well known. At Piacenza the best wines are the Cisolo, the Sangiovesi, and the Vinoranto. The wines of Tuscany, the Montepulciano, the Aleatico, the Montalcino, the Broglio, the Valgiano, &c., are well known even in England. The best wines in Umbria and the Marches are the Montefiascone, the Orvieto, the Prosanico, and the Vino Santo of Perugia. The importance of the vintage in the island of Sardinia has increased considerably of late years; the best wine is the Nasca, of an amber colour and of agreeable bouquet. The Neapolitan provinces produce excellent wine, the best known of which is the Lacryma Christi, grown at the foot of Vesuvius, and the Capri, from the island of Capri, in the Bay of Naples. Calabria also produces many varieties of good wines. The island of Sicily is celebrated for its wines, amongst which may be mentioned the Syracuse wine, which somewhat resembles Chablis. The vineyards of Massara and Castelvetro produce the Marsala, which resembles sherry. More than 500 persons are employed for this purpose, and the yearly production is estimated at 3,000,000 francs (£120,000). The following are the exports and imports of wines from 1862 to 1865:—

WINE IN THE WOOD.

<i>Imports.</i>		
	Quantity. Hectolitres.	Value. Francs.
1862	159,036 ..	8,952,000
1863	182,710 ..	9,135,000
1864	278,248 ..	13,912,000
1865	218,101 ..	10,805,000
<i>Exports.</i>		
	Quantity. Hectolitres.	Value. Francs.
1862	214,233 ..	10,712,000
1863	462,501 ..	23,135,000
1864	223,539 ..	11,176,000
1865	264,512 ..	13,225,000

WINE IN BOTTLES.

<i>Imports.</i>		
	No. of bottles.	Francs.
1862	288,715 ..	303,000
1863	407,432 ..	408,000
1864	315,968 ..	332,000
1865	345,627 ..	353,000
Average francs	..	11,050,000
<i>Exports.</i>		
	No. of bottles.	Francs.
1862	233,618 ..	245,000
1863	549,835 ..	577,000
1864	1,271,707 ..	1,325,000
1865	1,091,582 ..	1,164,000
Average francs	..	15,385,000

Colonies.

MINERALS IN TASMANIA.—A mineral discovery, which promises to be important, has recently been made on the banks of the River Don, Tasmania. A lode has been found, yielding cobalt, silver, copper, and antimony. A few stones broken from the lode were, a short time since, forwarded to an assayer at the Wallaroo Smelting Works, for analysis. The result was as follows:—Cobalt, 4 oz. in the ton; silver, 100 oz.; copper, 14 per cent., and a quantity of antimony. The ore is estimated at worth £85 per ton. A specimen of lead, as taken from the same locality, has also been analysed, and found to contain 82 per cent. of pure galena, besides several ounces of silver to the ton.

QUEENSLAND FINANCE.—It appears, from the report of the Treasurer of Queensland, that the cash expenditure of 1867 was £661,795 8s. 9d., and the receipts during the same period were £610,860 5s. 9d., the expenditure thus exceeding the receipts by £50,935 3s. The expenditure of the colony in 1866 exceeded its receipts by £161,430 10s. 10d. The receipts of the year 1867 exceeded those of the year 1866 by £120,590 10s. 2d.; but the amount of land orders redeemed by the sale of land shows a diminution in the latter year of £44,517 12s. 9d. The expenditure of the year 1867 exceeds that of 1865 by £67,665 8s. 8d.

LAND IN QUEENSLAND.—A Brisbane paper, referring to a recent Act of the colonial Parliament, says:—"For the first time in the history of Australia, the public lands of the colony of Queensland are fairly thrown open on the most easy terms to permanent occupation and settlement. The conditions under which land can be taken up for permanent settlement under the new Act are various, but in every case they are of the most liberal character, so much so, in fact, that every man who chooses can have a farm and work it in any way he thinks fit. If he is disposed to enter into cultivation, the best land for agriculture on the colony is at his disposal at 15s. per acre, with ten years to pay the money in. If he wishes to enter upon pastoral farming he can take up seven or eight square miles of land at from five to ten shillings per acre on the same terms, and by fencing and building on it during the ten years he more than fulfils the condition of improvements required by the Act. If he be a poor man, and only wishes to take up a small quantity of land, of from 80 to 160 acres in area, he can, under the homestead clauses, take up a farm of this kind, and by paying a quit-rent of a few pence per annum for five years, and residing on it for that time, and fencing in his farm, the land becomes his own for ever. These advantages are open to all. With the new industries that are springing up in Queensland, however, the new Land Act offers greater induce-

ments to emigrants possessed of such qualifications than any other British colony. Cotton-growing and sugar cultivation have now been proved to be successful undertakings on the rich agricultural lands of the colony, and other staples are attracting some considerable degree of attention."

Obituary.

JOHN CRAWFURD, F.R.S., a distinguished Oriental scholar and ethnologist, died on the 11th inst. He was born on the 13th of August, 1783, in the island of Islay, and was educated in the village school of Bowmore. In 1799, the profession of medicine having been chosen for him, Mr. Crawford repaired for his studies to Edinburgh, where he remained three years. In 1803 he obtained a medical appointment in the Indian Service, embarked for India in April, and landed in Calcutta in September of the same year. For the first five years of his residence in India he was employed in his professional duties with the army, chiefly in the North-West Provinces, in the neighbourhood of Delhi and Agra. In 1808 the same duties took him to Penang, in the Straits of Malacca, where he began to devote himself to that study of the languages and manners of the Malay race, which was destined to make him widely known. In 1811 he accompanied Lord Minto, then Governor-General of India, on the expedition which effected the conquest of Java. Afterwards, in consequence of his acquaintance with the Malay languages, he was appointed to represent the British Government at the Court of one of the native Princes, and it was then that he collected the materials for the work which he afterwards published, entitled, "The History of the Indian Archipelago." Java and their other Indian possessions having been restored to the Dutch, Mr. Crawford returned to England in 1817, and in 1820 published the work just mentioned. In 1821 he went back to India, and shortly after his return was appointed by the Marquis of Hastings, at that time Governor-General, to the diplomatic mission to Siam and Cochin China. In 1823 Mr. John Adam, *ad interim* Governor-General, appointed him to administer the new settlement of Singapore. In that position he remained three years, and concluded with the native chiefs, to whom the settlement belonged, the convention by which we hold its sovereignty. In 1826 he returned to Bengal, and was appointed by the Governor-General Commissioner in Pegu, and eventually, on the conclusion of peace, Envoy to the Burmese Court. In 1827 Mr. Crawford finally returned to England, and in the following year published an account of his mission to Siam and Cochin China, and in 1829 another of his mission to Burmah. After this period, long leisure, good health, and an inclination to study and capacity for work enabled him to keep up and perfect his stores of Indian and Eastern information. He was an indefatigable contributor to the press on matters relating to the East, and indeed on many other subjects. In 1852 he published a grammar and dictionary of the Malay languages, and in 1856 a descriptive dictionary of Malay and the languages of the Philippine Archipelago. He was elected a member of the Society of Arts in 1861, and frequently attended its meetings, often joining in the discussions. He was also well known at the Geographical and Ethnological Societies.

Publications Issued.

ANNUAIRE DE L'ECONOMIE POLITIQUE ET DE LA STATISTIQUE. Par Maurice Block. 23rd year, 12mo. MANUEL DU NEGOCIANT. Par Max. Hofmann, avec Introduction par Paul Boileau, 12m. MANUEL DES HALLES ET MARCHÉS EN GROS, GUIDE DE L'APPROVISIONNEUR,

&c. Par Ernest Thomas, 12mo. (*Guillaumin and Co.*, Paris).—Messrs. Guillaumin publish every season a considerable number of works connected with political economy, international law, and commerce. The little work which stands first in the above heading is the recognised handbook with respect to the subjects which it embraces, and contains a vast amount of matter in a small compass. It deals with the colonies and foreign countries, as well as France proper, and Paris in particular; and gives valuable information on the proceedings of learned societies, finance, the funds, public charity, public works, and other subjects that present special interest. The "Manuel du Négociant," as its title imports, is a collection in a handy form of information useful to merchants. The opening chapter gives a sketch of the commercial geography of the earth, with the products of its various regions, an account of the various means of communication between all parts of the world, and special information relative to France, tariffs and regulations respecting carriage of merchandise, &c. The second part treats of the administrative system as regards commerce in France, Government services, tribunals and chambers of commerce, authorised agents, financial and commercial establishments, licences and taxes, commercial forms, patents, trade marks and copyrights. This chapter contains much matter of value to those who have business in France where the regulations and customs of trade are so different to our own. The third part deals with commerce proper, navigation, imports and exports, tariffs, assurances, &c., all which are treated at considerable length. The remainder of the volume treats fully of money, weights and measures of France and other countries, with rules and examples for their reduction; commercial paper and exchange, bullion, commission, charges, and insurance, trade accounts and invoices fully exemplified, freight, tonnage, and measurement, &c., with a useful vocabulary of commercial terms and recognised abbreviations, forming altogether a valuable commercial companion. The "Manuel des Halles et Marchés en Gros" is an exposition of the system on which the Paris markets for the sale of grain, meat, fish, vegetables, and fruit, butter, cheese, and eggs are managed. A few particulars respecting the fish market will be *apropos* at present. It appears that the sale of fish in the markets of Paris was organised so far back as the year 1258, when authorised salesmen and *forts*, or ticket porters, were appointed by order of Saint Louis. The whole arrangement has been revised, abolished, and re-established at least half a dozen times in as many centuries. The system at present in force may be explained in a few lines. There are two sets of inspectors and assistants attached to the market, one, under the prefect of police, whose duty it is to maintain order, to see that the fish is in proper condition for sale, and that the business of the market is properly carried out; the other for the collection of the city dues. The market is opened every day by sound of bell, between six and eight o'clock, according to the season. There are eight salesmen appointed for salt-water fish, each having to lodge £240 by way of security. These salesmen act in concert as a body, whereas in other markets they act individually; they are appointed and may be removed by the prefect of police. The *forts*, or ticket porters, receive from two to twenty centimes per package, according to size, for placing the fish on the sale counters, and afterwards delivering it at the gate of the market. With some special exceptions all the fish is sold by auction. Common fish sold in the market pays a tax of 6 per cent. *ad valorem*, and all the better kinds 10 per cent. The salesmen receive a tax of 10, 15, or 20 centimes on each parcel sold, and, if they act as agents for the proprietor, one per cent. commission in addition. When fish is left unsold, and put aside for the next day, the porters receive a fee of ten centimes per package, and are responsible for its safety. Everything must be cleared out of the market enclosure within an hour after sale. The octroi duty taken by the city is

equivalent to 24s. per cwt. for all the superior kinds of fish, and 6s. per cwt. for the inferior kinds, with, in each case, two-tenths additional tax. It may be interesting to state that the list of the superior kinds of fish includes salmon, turbot, sturgeon, tunny, brill, trout, chad, mullet, lobsters, crawfish, and prawns. Fresh-water fish, salt fish, and oysters are all sold by different sets of salesmen, but the regulations and taxes are very nearly the same in all cases.

Notes.

THE SWINEY PROFESSORSHIP.—The trustees of the British Museum have appointed Dr. Cobbold, F.R.S., to this chair of Geology. It is tenable for five years, and the first course of lectures will be delivered in Scotland.

THE ROYAL ACADEMY OF MUSIC.—On Saturday, the 2nd inst., a special meeting of the supporters of this institution was held in the concert-room of the academy, in Tenterden-street, Hanover-square. The object of the meeting was to consider the present financial position of the institution. It appears that Her Majesty's Government has refused to comply with the terms of a memorial asking that the academy should be subsidised as a national institution, and have also withdrawn the grant of £500, which has been made out of the public treasury since 1864. Sir John Pakington, Bart., M.P., presided, and in the course of his address related how the government had received, and had carefully considered, a memorial asking them to give an annual grant of £2,000 to the academy, and how they had decided not only to refuse that sum, but also to withdraw the grant of £500 which has been made yearly since 1864. Before the meeting concluded, it was decided to appoint a committee of members of the musical profession and subscribers, to consider what steps should be taken.

UTILITY OF COAL ASH IN AGRICULTURE.—A correspondent of the Paris *Journal of Agriculture*, seeing the amount of ashes thrown away annually, and considering that Sir Humphrey Davy and other chemists have found by analysis that ashes contain many substances which contribute to vegetable life, such as sulphates of potash and lime, various compounds of acids and minerals, and carbonates of lime, alumina and silica, has made some interesting experiments; in the autumn he filled three flower-pots with coal ashes, without admixture with any other substance; in one pot he sowed wheat, in another oats, and in the third strawberry seeds. The pots were then placed in a garden bed and left to themselves. In the month of March the plants were in a very thriving condition, and in April they were luxuriant. The wheat and oats ripened perfectly, the grains being large and heavy, and the straw, in the case of the wheat, 55 inches, and in that of the oats 43 inches high. The strawberry plants continued to flourish till October, when it was necessary to transplant them, and after being planted out in the open ground they succeeded so well that the writer says they surpassed all his other seedlings. The experiment is an interesting one.

Correspondence.

BEETROOT SUGAR.—SIR,—In reference to statistics and remarks upon Mr. Gibbs' paper on beetroot sugar (read before the Society, April 22nd, and also that gentleman's letter of May 1), I beg to say that the points mooted were the insufficiency of data for manufacturers and capitalists, and why they should be called upon in 1868 to depend upon the state of trade of 1866? Mr. Gibbs had his attention particularly drawn to these points, and distinctly explained that no later returns had been made by the Board of Trade, and also that these

returns distinctly specified raw sugar only (see page 422 of *Journal*); his letter, however, given at page 449, shows that he had not quoted 660,384 cwt. of refined sugar imported that year. Now, it was this very kind of omission that induced me to follow another speaker on the same subject, as I knew that some countries were increasing their competitive supplies 100 per cent. after 1866. When discussing the influence of beet-sugar it must be evident that refined sugar imported represents a much larger quantity of the raw material raised in a foreign country, and thus not only are the colonies prejudiced by supplies readily obtained across the Channel, but the property, plant, and labour of English refiners are not required to that extent. My off-hand figures then had reference to one omitted quality of sugar, and perhaps applied to one country only. Of the sugar thus omitted by Mr. Gibbs from beet-crop countries, I take the official figures of the French Imperial Government, who declare there have been sent of refined sugar to England:—

	1866. Kilogrammes.	1867. Kilogrammes.
France . . .	9,549,671	18,454,099
Belgium ..	4,408,613	4,000,000*
Holland ..	34,307,919	37,932,286
Total . . .	48,265,599	60,386,385

and this 60 millions kilogrammes of foreign refined sugar may be taken as about 132 millions of English lbs. imported for the year 1867. Taking the French official figures for January and February, there was imported into England:—

In the year 1866	1,163,899 kilos.
" 1867	3,787,655 "
" 1868	2,316,880 "

and at the end of March the French exports to foreign countries, for two years, stand thus:—12 millions of kilogrammes for 1867 and 24 millions of kilos. for 1868, omitting all mention of refined sugar for 1866, '67, and '68. Mr. Gibbs's statement can be somewhat understood as to the causes for some of the largest and best appointed refineries in London being closed and cannot be sold, "and many others are yet to follow" (p. 416); but, I may ask, does the suggestion to grow beet-root crops, and get the products at onerous risks, and create new manufactories, afford compensation to those who have been for years in trade, or does it afford temptation to the capital of willing agriculturists? Mr. Gibbs was distinctly understood to say that no returns had been made by the Board of Trade since 1866. This meaning was conveyed and was so accepted at the meeting, whatever may have been the source of misapprehension; I have now to state that the Board of Trade has compiled and published, by authority, sugar totals regularly for the months, quarters, and year 1867, and even the quarter ending March 1868 was published before the reading of Mr. Gibbs's paper, including and comparing similar periods for 1865, '66, and '67. From their report (*Trade and Navigation*, 1867, at page 7), it appears there were imported of refined sugar into England, to the end of December, for the two years—in 1866, 660,384 cwts.; and in 1867, 834,452 cwts. Of first-class un-refined sugar 92,318 cwts. in 1866, and 147,881 cwts. in 1867. Of imports of raw sugar of 2nd, 3rd, and 4th classes there were about 10 millions of cwts. each year, thus apporportioned to foreign and British possessions:—

	In 1866.	In 1867.
British	5,723,990	4,389,492
Foreign	4,824,711	6,007,942
	10,548,701	10,397,434

It will be thus seen that influences are at work that depress the productions of our colonies, while countries

* Founded on nine months' figures in 1867.

compete at our own doors and increase their supply to markets constantly in demand. For France alone, the beetroot produce of the season of 1866-7 was 167,025-252 kilogrammes; and for 1867-8, 205,810-315 kilogrammes. To show whether the colonies have anything to fear, let us take the Board of Trade tables as to the computed real money values of imported sugars. Of refined sugars in 1866, £927,648; of refined sugars in 1867, £1,237,736. The value of first class unrefined was, for 1866, £112,576, and £167,787 for the year 1867. Of the raw sugars of the 2nd, 3rd, and 4th class, for 1866, the value was £9,952,216; and for 1867, £10,612,160. If we take the value of raw sugars from British possessions only, it was £5,613,273 for 1866, but for 1867, £4,639,421; so that in the year 1867 the British colonies had lost ground in money value to the extent of one million sterling. (See page 16 of "Accounts relating to Trade and Navigation," for twelve months, 1867). The British revenue received (page 49) for refined sugar and sugar-candy duty from British possessions out of Europe, in 1866, £2,102; in 1867, £839; from foreign countries, in 1866, £492,786; in 1867, £469,421. The duties on raw sugars were, collected from British possessions out of Europe, for 1866, £2,711,136; 1867, £2,228,699; from foreign countries, for 1866, £2,337,896; 1867, £3,061,368; making a total of, for 1866, £5,049,032; 1867, £5,290,067. So that foreign competition is not only able to break up established, well-appointed refineries at home, but competes with the declining influence of our colonies, and thus we have the Imperial revenue actually increased and more aided by foreign produce than by our own skill, capital, labour, and estates. Surely our enlightened men will see some impending danger, if the English markets and the Imperial revenue are thus made seemingly prosperous, but really dependent upon the action of foreign governments and their peoples. It is proper to remark that all imports of sugar to England from the Continent may be assumed as the result of beet-root produce, for even, if these countries import and export cane-sugar, they are enabled to do this, by obtaining beet-root sugar in excess; it is thus taken for granted by all parties; so much so indeed, that I do not remember the title of beet-root sugar in the Board of Trade or Customs returns. The discussion on the Customs duties, and incidentally on the sugar competition between France and Belgium, in the French Corps Legislatif, as given in the *Moniteur* (May 2, p. 589), may shew in very few words something of the ruin that may follow in this country, injudicious crops of beet-roots, and the manufacture of beet-root sugars, as I believe the low sugars would be absolutely useless to the farmers. In the debate, M. des Rotours said, the refineries of sugar give three distinct products. The Candies, properly so called (or refined sugar); 2nd, the Vergeoises or Cassonades (low brown or bastard sugars); and 3rd, Molasses. M. Ozenne (Councillor of State, Commissaire du Gouvernement,) said, "In France they use the sugar of beet, whilst at Antwerp, and generally in Belgium, they more particularly use cane-sugar. All the world knows that the low products of the cane have a more considerable value than the low products of the *betterave* (beet-root), for this simple reason, that the one is eatable, and the other can only be of service for distillation." Such is the last week's information on beet-root sugars; and again I may ask, is it wise to call the attention of agriculturists, tenant farmers, and others to the subject, without warning them that if they succeed in making sugar, they will then have to pay 12s. duty on each cwt., this is on all saccharine matters, including the low sugars which are useless except for distillation, and this involves a permit duty, excise, surveys of premises, vessels and apparatus, with necessary consequences of permits, visits, and duties to pay, and severe risks of penalties connected with the production, storing, and sale of spirits. The present state of things in England at this time is, that works are being closed and their engines and

machines, &c., sold for a price about equal to the expense of fitting them in their places for work; all other metal work sold at the price for old materials, and our colonies are declining. We may, however, suppose that the refiners are capable of looking to their own interests, and that the West Indies and other colonies have their defenders and exponents; but I confess I do not see how the matter will be mended by the farmer being induced to grow crops to be manufactured with the *chances* of being exchequered; and I spoke only with good intentions, and on behalf of agricultural talent, enterprise, and capital, that they should be truly and completely aroused to the subject of foreign competition, and with a feeling of respect for one great body of intelligent men, and as having been many years honorary consulting chemist for North Lincolnshire.—I am, &c., THOMAS J. PEARSELL, F.C.S.

For further information on these great sugar questions, I may refer with pleasure to the very full, and, indeed, admirable returns made on all branches of sugar imports from 1844 to 1867 inclusive, moved for by Mr. Moffatt, and ordered by the House of Commons to be printed April 22nd, and published with official promptitude some days since; these elaborate and extended customs tables will supersede or lessen the labour of references to the other departmental tables of the Board of Trade, and also of foreign journals. From these laborious tables can be seen at a glance, for any number of years since 1844, such particulars as these:—The imports of refined sugar for the years 1860-1-2-3, averaged 255,819 cwt.; then in 1864, consequent upon legislation, sprung up to 700,000 cwt. The average imports for 1864, 5, 6, and 7, being 759,090 cwt.

MEETINGS FOR THE ENSUING WEEK.

- MON.....British Architects, 8.
Asiatic, 3. Annual Meeting.
Victoria Inst., 8.
R. United Service Inst., 8. Mr. Samuel Mackie, "The National Defences of Great Britain, especially with reference to the future requirements of Floating Forts."
Social Science Assoc., 8. Jurisprudence Department. Mr. Robert Wilson, "On the Bankruptcy Law."
- TUES ...Civil Engineers, 8. Mr. Edwin Clark, "On Engineering Philosophy: The Durability of Materials."
Statistical, 8. Mr. Courtney, "On the Finances of the United States, 1861-67."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."
- WED ...Society of Arts, 8. Mr. J. Bailey Denton, "On the Condition of the Agricultural Labourer."
Geological, 8.
Pharmaceutical, 11 a.m. Annual Meeting.
R. Society of Literature, 8. Sir Charles Nicholson, "On some Remains of the Disk-worshippers at Memphis."
- THUR ...Antiquaries, 8.
Zoological, 4.
Chemical, 8.
Numismatic, 7.
Royal Inst., 3. Prof. Grant, "On Astronomy."
Society of Fine Arts, 8. Mr. George Cooper, "On the Influence of International Exhibitions upon our Domestic Decorative Art."
- FRI.....Royal Inst., 8. Prof. Odling, "On the Rapid Decomposition of Water, and other effects of the Heat of the Oxygen-hydrogen Flame."
R. United Service Inst., 3. Mr. M. Parkyns, "On Abyssinia."
- SAT Royal Inst., 3. Prof. Grant, "On Astronomy."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par.
Numb.
Schools Inquiry—Reports, Vol. IX.
Colonial Possessions—Reports, Part III. (Eastern Colonies)

Delivered on 28th April, 1868.

86. Bill—Entail Amendment (Scotland).
97. " Documentary Evidence.
215. Post Office—Comparative Statement.
220. Richmond Green—Report.
Public Petitions—Fifteenth Report.

- Delivered on 30th April, 1868.*
 94. Bill—County Courts Admiralty Jurisdiction (amended).
 119. (11.) Trade and Navigation—Accounts (31st March, 1868).
 130. (11.) Railway and Canal Bills—Third Report.
 228. Municipal Boroughs (England and Wales)—Abstract.

Delivered on 1st May, 1868.
 209. Judge's Lodgings—Return.

216. Metropolis Gas—Correspondence.
 217. Occupiers (Scotland)—Return.
 224. Merchant Seamen's Fund—Account.
 Education (Scotland)—Third Report, Vol. 1.

- Delivered on 2nd May, 1868.*
 99. Bill—Municipal Rate (Edinburgh).
 201. East India (Godavary River)—Return.
 227. Metropolitan Foreign Cattle Market Bill—First Report.
 230. Post Office (Sunday Delivery) (Scotland)—Regulations.
 Public Petitions—Sixteenth Report.

- Delivered on 4th May, 1868.*
 102. Bill—Vagrant Act Amendment.
 128. Navy (Channel Fleet)—Return.

- Delivered on 5th May, 1868.*
 96. Bill—Cotton Statistics.
 98. " Non-Traders Bankruptcy (Ireland).
 42. (11.) Postal Contract.
 213. Sugar, &c.—Tabular Return.
 214. Foreign Sugar—Return.
 221. Spirits—Returns.
 223. Mercantile Marine Fund—Account.
 225. Seamen's Savings Banks and Seamen's Money Orders—Account.
 226. Ramsgate Harbour—Statement.
 229. Peerages and Baronetries—Return.
 235. Royal Gun Factory—Estimates.
 236. Electoral Statistics (Ireland)—Returns.

SESSION 1867.
 431. (D.) Poor Rates and Pauperism—Return (D).

- Delivered on 6th May, 1868.*
 91. Bill—Government of India Act Amendment.
 92. " Governor General of India.
 95. " Military at Elections (Ireland).
 203. (3.) Railways Abandonment—Report of the Board of Trade.
 207. County Treasurers—Abstract of Accounts.
 222. Criminal Offenders (Scotland)—Abstract of Tables.
 Victoria—Further Correspondence.
 Trades Unions and other Associations—Fifth Report of Commissioners.
 Public Petitions—Seventeenth Report.

- Delivered on 7th May, 1868.*
 101. Bill—Sea Fisheries (Ireland).
 130. (11.) Railway and Canal Bills—Fourth Report.
 203. (4.) Railways Abandonment—Report of Board of Trade.
 206. Abyssinian Expedition—Return.
 210. Public Income and Expenditure—Account (31st March, 1868).
 245. Counties (Ireland)—Return.
 246. Area, Population, &c. (Ireland)—Return.

Patents.

From Commissioners of Patents' Journal, May 8.

GRANTS OF PROVISIONAL PROTECTION.

- Anæsthetics, preparing, &c.—1263—A. P. Price and J. A. Wanklyn.
 Animals, shearing or clipping the wool or hair of—1299—A. D. Renshaw.
 Baking, &c., apparatus for—1343—C. Brown.
 Boilers—1281—J. and J. A. Fawcett.
 Boilers, &c., preventing incrustation in—1347—C. W. Harrison.
 Boilers, &c., securing tubes in—1257—D. Smith.
 Brick-making machinery—1268—R. Schollefeld.
 Brick-making machinery—1287—J. J. R. Humes and J. G. Sullivan.
 Brooches, &c., spring fastenings for—1328—J. Bush & H. Welchman.
 Brushing and sweeping machines—1330—G. F. and J. Stidolph and T. Simpson.
 Capstans—916—W. Clarke and E. Walker.
 Carding and condensing engines—1265—G. Lister.
 Carpet linings—1316—W. R. Lake.
 Cartridge boxes—1339—W. R. Lake.
 Casks—1335—J. Reid.
 Churning, &c., apparatus for—1264—T. Bradford.
 Compasses, correcting the deviations of, in iron ships—1300—J. H. Johnson.
 Copying presses—1277—C. D. Abel.
 Cotton, &c., winding on to cards, &c.—1000—R. Smith.
 Crank pins, &c., machines for turning off—1270—W. Lund.
 Curtain poles and laths—1301—J. and H. T. Fugl.
 Elastic bands—1289—G. Coles, J. A. Jaques, and J. A. Fanshawe.
 Engines and pumps, rotary—1279—J. Cooke.
 Engines, governors for—1272—H. W. Widmark.
 Engines, marine—1294—E. Kemp and H. Gourlay.
 Engines, motive-power—1302—M. S. Maynard and R. Grime.
 Explosive compounds—1210—G. Clark.
 Fabrics, ornamental—1305—W. Clarke.
 Fabrics, textile, treating—1278—C. D. Abel.

- Fabrics, waterproof—1308—T. Whittaker.
 Fabrics, woven—1345—R. and T. Nuttall and B. Barber.
 Felt, machinery for manufacturing—1328—E. Roston and W. W. Whittaker.
 Filaments, producing from various substances—1296—G. Coles, J. A. Jaques, and J. A. Fanshawe.
 Fire-arms, breech-loading—922—R. Townsend.
 Gas, &c.—1283—W. Malam.
 Hats and bonnets—1266—E. T. Hughes.
 Hats called "Son' westers"—1229—A. and L. Braham.
 Iron and steel—996—R. A. Hardcastle.
 Iron and steel—1148—J. Griffiths and J. Jeavons.
 Lamps—1291—A. Cole and J. Carter.
 Light, ascertaining the actinic power of—1297—L. Bing.
 Lubricators—1269—A. Ashley, E. Rawnsley, and W. P. Waite.
 Mangles, &c., bowls for—1325—T. Hardcastle.
 Matches, safety—1309—H. Howse.
 Metal, sheet, manufacturing small articles from—1315—W. R. Lake.
 Millstones—1275—A. B. Childs.
 Motive-power, transmitting and multiplying—1331—A. M. Clark.
 Nails, manufacturing—1293—W. Gorse.
 Nails, &c., manufacturing—1338—A. Carter.
 Ores and minerals, extracting copper from—1240—R. Oxlard.
 Paddle wheels—1318—W. E. Newton.
 Paddle wheels, &c.—1274—R. Hill and J. F. D'Oyly.
 Petroleum, &c., storing and burning—1202—L. Verstraet.
 Phosphates, &c., obtaining—1267—J. Hargreaves.
 Pistons, &c., metallic packings for—1303—J. Johnson.
 Railway carriages and waggons—1321—R. F. Fairlie.
 Ring spinning, rings for—1288—A. V. Newton.
 Ropes, apparatus for tightening, &c.—1295—A. Paget.
 Spinning and doubling machinery—1232—J. B. Farrar.
 Spinning or twisting apparatus—1284—J. McGhie.
 Stamping, dating, &c., apparatus for—1307—C. B. Ingham.
 Steam, generating—1324—W. Hamilton.
 Tables—1323—E. Samson.
 Tailors' irons—1327—J. Whitehouse.
 Threshing machines—1320—H. H. Murdoch.
 Water-closets—1317—H. Hill.
 Window sashes, &c., fastenings for—1271—N. Ager.
 Wood, machinery for sawing—1337—J. Casson.
 Wood, planing and cutting—1285—S. W. Worssam, jun.
 Yarns, &c., sizing, &c.—1286—W. W. Symington.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

- Buckets, &c.—1446—W. R. Lake.
 Fabrics, manufacturing—1400—J. Booth.
 Liquids, measuring, &c., the flow of—1434—H. A. Bonneville.

PATENTS SEALED.

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|---|------------------------------------|
| 3170. S. Simon. | 3264. C. E. Brooman. |
| 3173. C. Bedells. | 3273. R. Ward. |
| 3177. J. H. W. and A. W. Biggs. | 3292. J. Owens. |
| 3179. W. Payne. | 3321. C. E. Brooman. |
| 3181. S. Buxton and W. Gardam. | 3334. A. V. Newton. |
| 3185. W. R. Lake. | 3406. S. Sharcock. |
| 3187. W. R. Lake. | 3441. R. Hornsby & J. E. Phillips. |
| 3189. W. R. Lake. | 3444. F. H. Ensor. |
| 3191. F. L. de Gerbeth. | 3505. C. Conner. |
| 3193. F. Ransome, H. Bessemer, and E. L. Ransome. | 3610. J. Atkins. |
| 3194. J. C. Bayley and D. Campbell. | 3611. J. Clay. |
| 3202. M. B. Westhead & R. Smith. | 3622. G. Davies. |
| 3215. U. P. Würfein. | 3636. E. and A. Ludlow. |
| 3216. R. Adams. | 3702. J. Davison. |
| 3224. G. Kent. | 218. H. Brinsmead. |
| 3249. R. Holliday. | 393. H. Bunning, jun. |
| | 830. C. Attwood. |
| | 891. W. E. Newton. |

From Commissioners of Patents' Journal, May 12.

PATENTS SEALED.

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| 3210. F. Andrew & E. Whittaker. | 3260. J. G. Tongue. |
| 3212. A. M. Clark. | 3262. R. Husband. |
| 3214. W. R. Lake. | 3324. J. H. Johnson. |
| 3220. P. E. Bland. | 3361. J. S. Smith. |
| 3223. P. de Bayay. | 3366. A. Mackie. |
| 3228. L. A. Wainman. | 3396. T. B. Jordan and J. Darlington. |
| 3229. A. M. Clark. | 3552. W. E. Newton. |
| 3231. W. R. Lake. | 3553. L. Christophe and J. Montigny. |
| 3234. P. M. Parsons. | 1. W. R. Lake. |
| 3235. G. R. Solomon, jun., and | 84. W. R. Lake. |
| 3238. A. Airan. | 111. J. H. Johnson. |
| 3240. L. B. Bertram. | 602. W. Krutzsch. |
| 3243. A. M. Clark. | |

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

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| 1262. J. McGlashan. | 1625. J. Hartley. |
| 1335. W. Clark. | 1275. R. B. Cooley. |
| 1319. H. Ransford. | 1345. H. Besley. |
| 1360. J. Worrall and T. Hughes. | 1313. A. Parkes. |

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

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|--------------------------------------|--------------------------|
| 1134. T. Blackburn and Mark Knowles. | 1190. J. F. L. Baddeley. |
| | 1221. R. Hornsby, jun. |